AUTOMOTIVE INDUSTRIES

PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES • BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY
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ENGINEERING • PRODUCTION • MANAGEMENT

DECEMBER 15, 1950

In This Issue . . .

Studebaker V-Eight Engine Production

Increased Efficiency with Television

Pontiac, Ford, Chevrolet '51 Improvements

Stepless Mechanical Transmission

Welding Without Heat or Electricity

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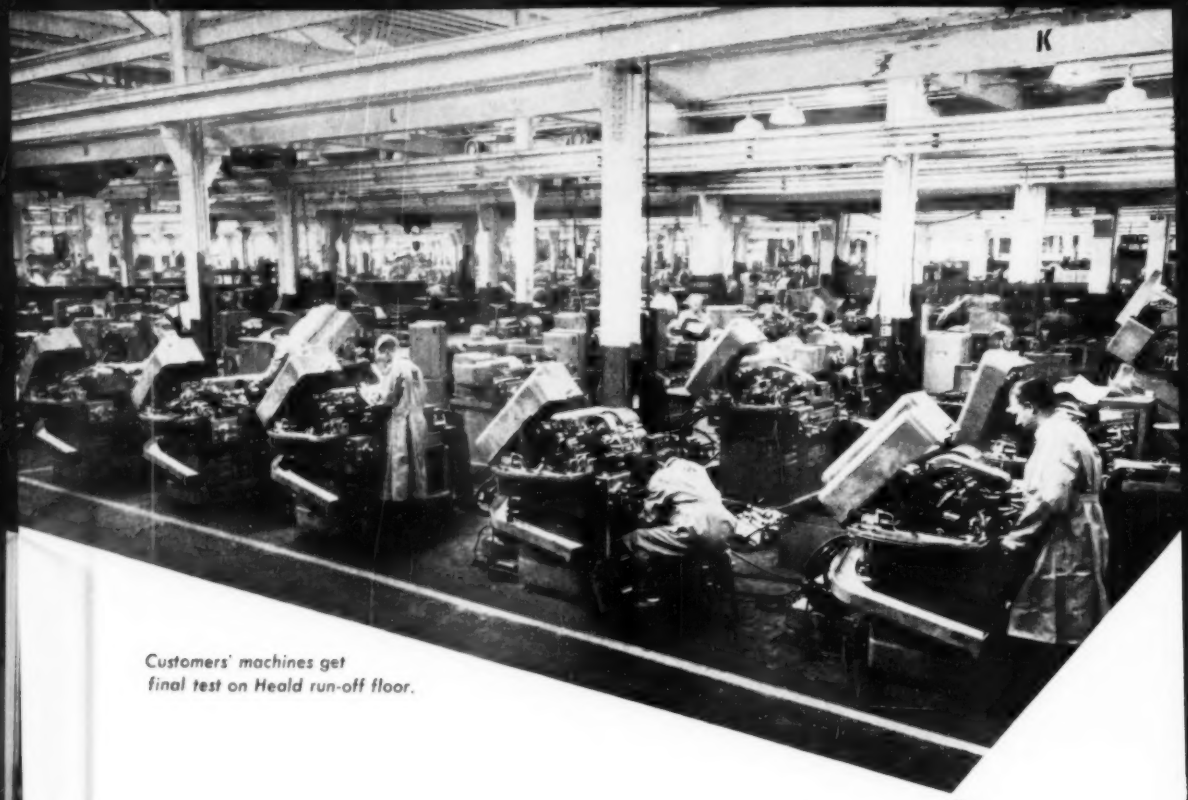

Customers' machines get final test on Heald run-off floor.

starting point*

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* Yes—precision production lines the world over have had their beginning *right here!*

For this is the Heald run-off floor, where *every machine* is put through its paces before shipment—turning out exactly the same parts it will handle on the customer's production line, at the same high production rates and the same close tolerances for size, finish, accuracy and precision.

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JANUARY 29, 1947 MILWAUKEE JOURNAL PHOTO

REPEAT PERFORMANCE?

● It won't be by popular request, but *The Big Snow* may be booked for a return engagement in your city this winter. And . . . are you all set for it?

With Waukesha-powered snow plows you *will* be. Then you can put the *open for business* sign on streets and highways, and keep 'em that way.

You'll get action—look at this Model 72 Snow King Rotary Plow. It's mounted on the rear of a truck and independently powered by a Waukesha 145-GKU. The plow's blade pierces and feeds the snow to the Waukesha-powered rotor, which cuts and discharges the snow by centrifugal force straight up, and the deflecting chute throws it to either side, or in opposite directions, off the highway or into waiting trucks.

Find out how Waukesha builds the utmost in power output and dependability into this splendid six. Get Bulletin 1186.

WAUKESHA MOTOR COMPANY, WAUKESHA, WIS.
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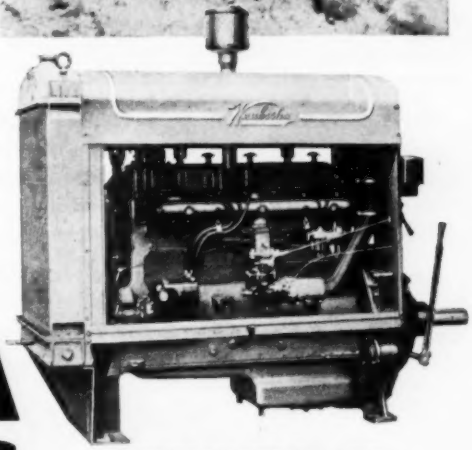
WAUKESHA ENGINES



WAUKESHA 145-GKU Power Unit— six cylinders, 5¼-in. x 6-in., 779 cu. in. displacement, 167 maximum horsepower.

INCONEL EXHAUST PIPES ON KENWORTH TRUCKS

Truck and bus maker reports on Inconel exhaust pipes on super-charged Cummins engines, Hall-Scott engines, and cab-over trucks.

Big news in the automotive industry is the sensational performance of Inconel® exhaust systems.

Inconel mufflers and exhaust systems are outlasting steel ones by *ten times* or more . . . enabling fleet operators to realize important savings in upkeep costs.

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67 Wall Street, New York 5, N. Y.

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AUTOMOTIVE INDUSTRIES

Published Semi-Monthly

Dec. 15, 1950 Vol. 103, No. 12

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AUTOMOTIVE INDUSTRIES is a consolidation of The Automobile (weekly) and the Motor Review (weekly), May 1902; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, Mar. 1918.

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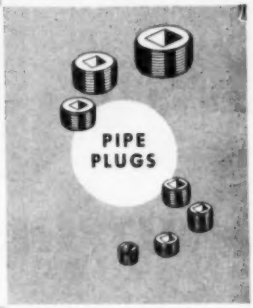

Modern high speed single and 6-spindle automatics—together with complete secondary equipment, including grinding and brazing—plus 30 years' experience, assure you "The Best in Quality Screw Machine Products."

Your requirements, up to 2⅝", are made with utmost precision, and with promptest delivery assurances.

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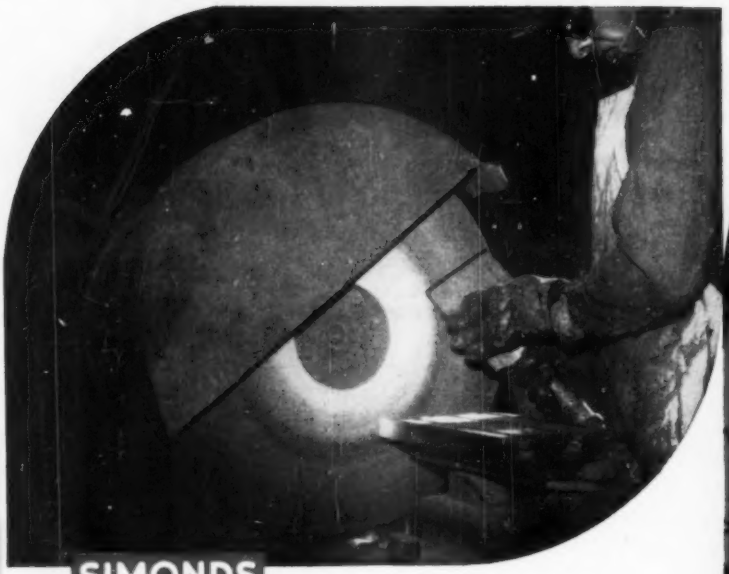

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Maximum grinding contact! That's why Simonds Abrasive Company discs give fast, economical production. The side of the disc is used — grinds large areas quicker. Only usable abrasive charged for. Less machine wear — discs give better balance, reduced vibration and less overhang on shaft and bearings.

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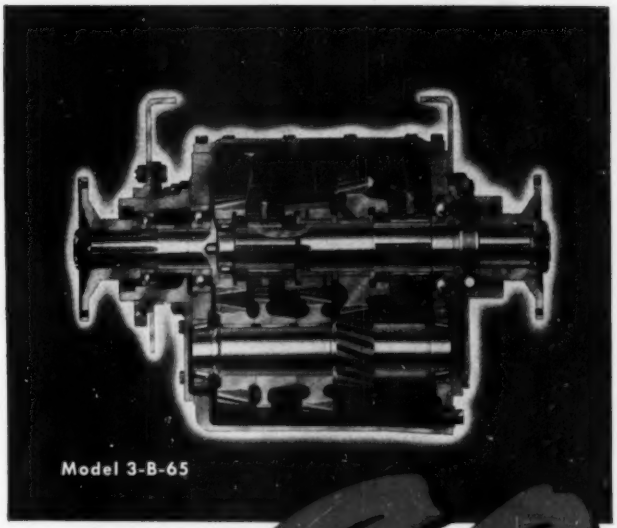

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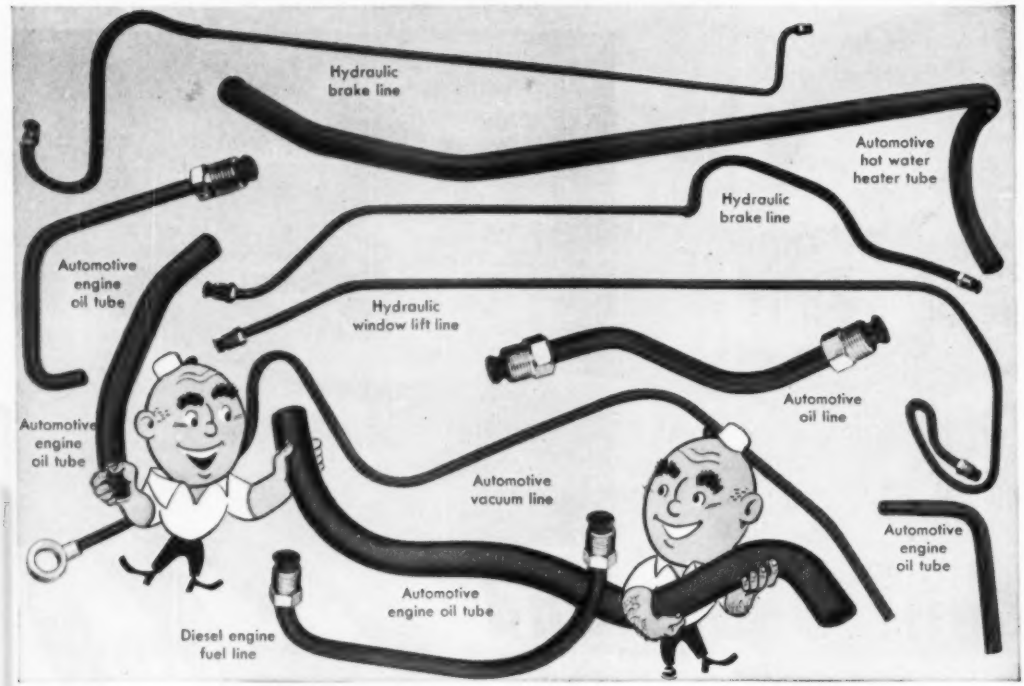

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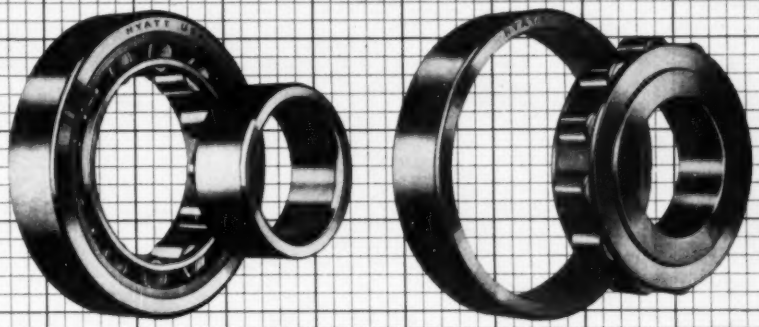
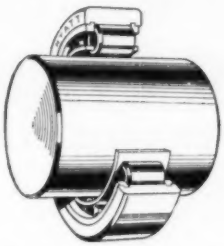
Here's another design advantage with HYATT HY-LOADS



FOR BEARING applications where the design is such that an inner or outer race can be omitted, the separability features of Hyatt Hy-Load Roller Bearings are a distinct advantage.



When a shaft of larger diameter is needed for greater rigidity, or a bearing of smaller size is desired, the inner race of a separable inner race type Hyatt Hy-Load can be omitted and the rollers operated directly on a properly hardened and ground shaft.

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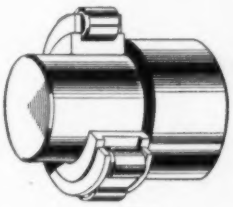

Many other design advantages are yours with Hyatt Hy-Load and likewise with Hyatt Spherangular Roller Bearings, both of which are serving so well in so many millions of cars, trucks and buses. Hyatt Bearings Division, General Motors Corp., Harrison, N. J. and Detroit, Michigan.

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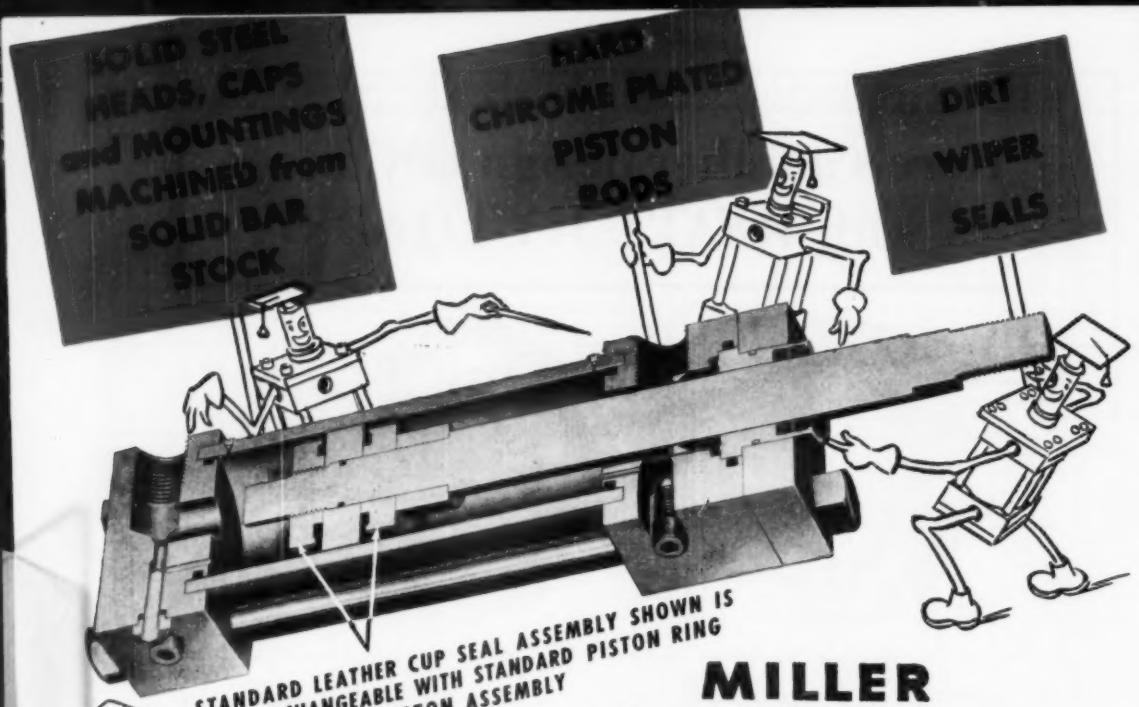

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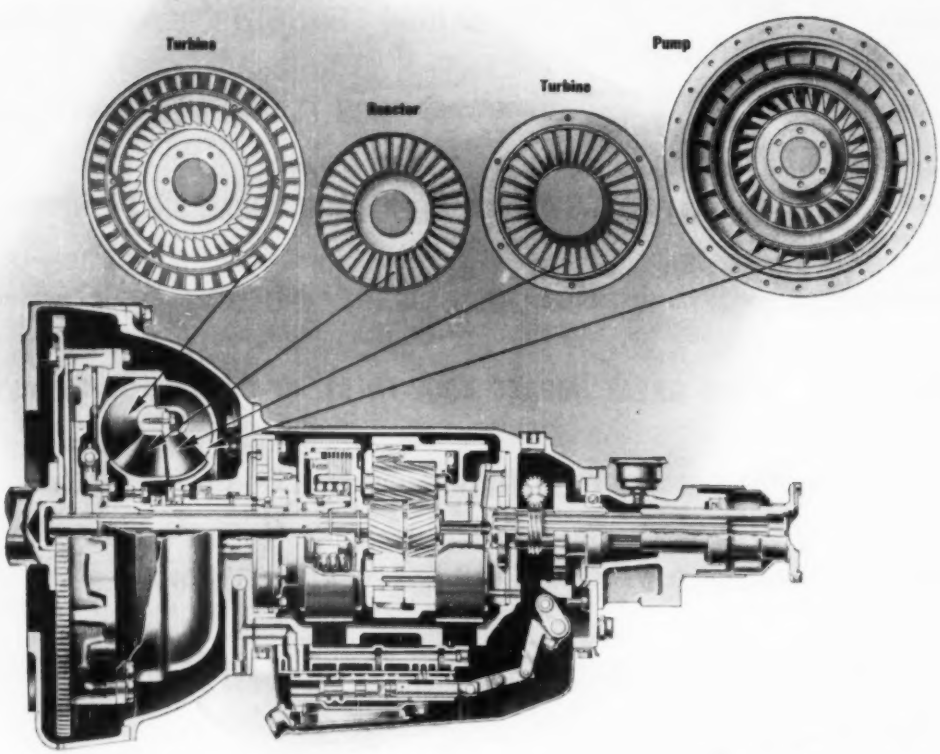
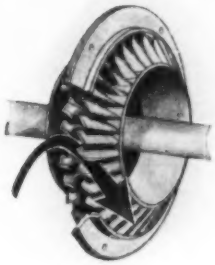


...ALUMINUM CASTINGS BY ALCOA



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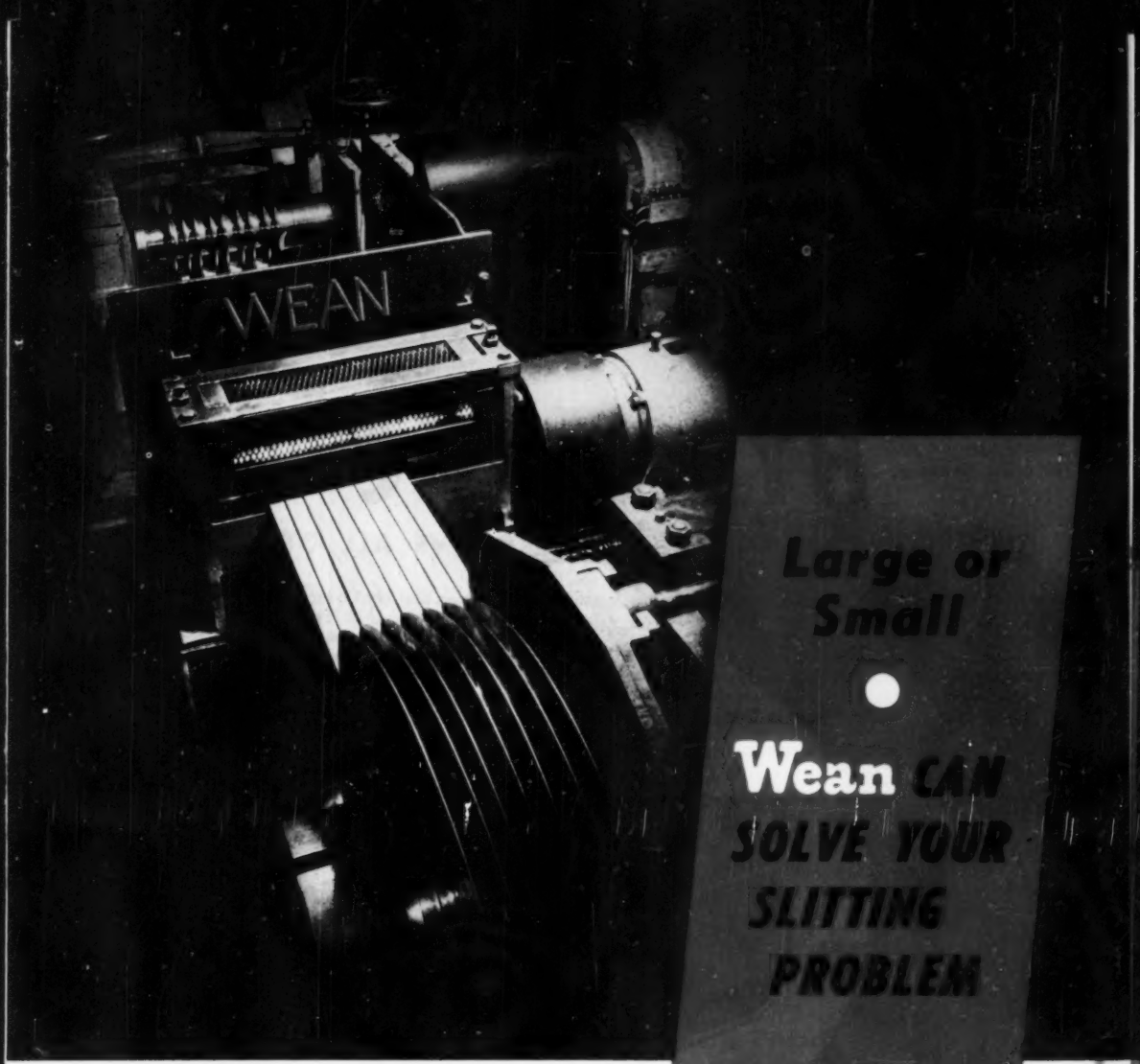

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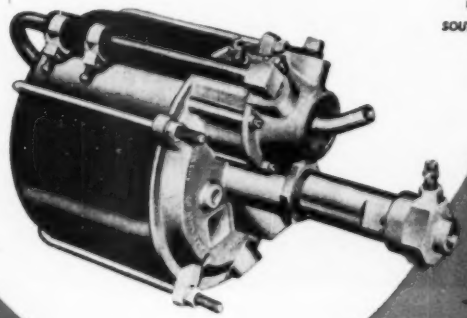
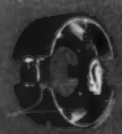
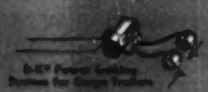




Centrimount Service and Parking Brake



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BUILDERS
OF THE BASICS
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Bendix® Brakes for Buses, Trucks, and Passenger Cars

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AUTOMOTIVE INDUSTRIES

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AUTOMOTIVE INDUSTRIES
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High Spots of This Issue

★ Infinitely Variable Mechanical Transmission

From England comes news of an infinitely variable gear operating on the principle of power transmitted through the drag force in thin films of oil, interposed between the driving and driven members. This gear is shortly to appear on a British motor bus. Page 32.

★ Studebaker's V-8 Engine Production—Part One

Modern equipment to the Nth degree is found at Studebaker's plant—result of a recent $20-million expansion and tooling program. Given in this article are impressive glimpses into intricate operations performed on the engine block by numerous enormous transfer machines. Page 34.

★ Chevrolet's 1951 Cars and Trucks

Principle mechanical change for 1951 is in the new two-shoe self-energizing brakes having one hydraulic cylinder per wheel. Illustrations and explanations of this and other interesting improvements, refinements, and changes start on page 37.

★ Modern Approach to Product Design

The author discusses the designing of products to utilize the electric-furnace brazing technique. He stresses use of prefabricated subassemblies wherever possible, to keep down costs of raw materials. Follows, a presentation of electric furnace brazing facilities at Superweld Corp. Page 41.

★ Welding Without Heat or Electricity

A method of cold pressure welding known as the Koldweld process has recently been made available in this country. It is said to be applicable to all non-ferrous metals, particularly aluminum and its alloys. This account discusses the trap weld, wave weld, stagger weld, sandwich weld, and other applications. Page 48.

★ 15 New Product Items And Other High Spots, Such As:

The 1951 Pontiac; a new hand brake requiring less effort; a mechanical self-adjusting valve tappet; problems of engine operation discussed at recent SAE meetings; Ford 1951 truck improvements; and how television is increasing efficiency at the new Fisher body plant.

News of the Automotive Industries, Page 17
For Complete Table of Contents, See Page 3

Now, a high strength ALLOY that Machines Easily

Never before an alloy steel that offered you these combined advantages! With Ryerson Rycut you can speed up production—reduce downtime—get a better surface on your machined product! This remarkable medium carbon alloy machines 25% to 50% faster and at much higher tensiles than other alloys of the same type! It actually doubles—may even quadruple your tool life! And grinding is often unnecessary because many parts may be finish machined.

Though offering you all these time and money saving advantages, the initial cost of Rycut is practically the same as that of standard medium carbon alloys!

Rycut responds uniformly to the conventional oil-quench method of heat treatment. It may also be flame or induction hardened. And when heat treating Rycut, your Ryerson alloy certificate guides you to the required results.

Rycut is available for immediate delivery—annealed or heat treated—in rounds, flats or squares, in a wide range of sizes. For test samples or a large shipment, contact your nearby Ryerson Plant.

PRINCIPAL PRODUCTS

CARBON STEEL BARS—Hot rolled & cold finished
STRUCTURALS—Channels, angles, beams, etc.
PLATES—Many types including Inland 4-Way Safety Plate
SHEETS—Hot & cold rolled, many types & coatings
TUBING—Seamless & welded, mechanical & boiler tubes
ALLOYS—Hot rolled, cold finished, heat treated
STAINLESS—Allegheny bars, plates, sheets, tubes, etc.
TOOL STEEL—Oil and water hardening
REINFORCING—Bars & Accessories, spirals, wire mesh
MACHINERY & TOOLS—For metal fabrication

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • CINCINNATI • CLEVELAND
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RYERSON CERTIFIED STEELS

RYERSON STEEL

News of the AUTOMOTIVE INDUSTRIES

Vol. 103, No. 12 December 15, 1950

Vehicle Output May Miss 8 Million This Year

It now seems improbable that the automobile industry will turn out eight million motor vehicles this year. Nonetheless, it will come very, very close to that goal, and there is every indication that 1950 will stand for some time as the peak year in production. With five weeks to go, the industry needed a total of 750,000 vehicles to reach the eight million mark, or an average of 150,000 a week. With Chrysler scheduled to be down for model changeover during at least part of the month, and with other companies finding it increasingly difficult to maintain production schedules because of shortages of steel and other materials, chances of hitting the eight million mark are not too bright, although certainly not out of the realm of possibility. In any event, the industry won't miss eight million by very much.

1951 Chrysler to Have Hydraulic Steering

Chrysler Div. of Chrysler Corp. will offer hydraulic power steering on some of its 1951 models. The power steering device called Hydraguide will be supplied by Gemmer Manufacturing Co., and will be standard equipment on the Imperial models, and optional at extra cost on the New Yorker series.

Nash Nets $30.5 Million for Year

The Nash-Kelvinator Corp. and its subsidiaries had a net profit for the fiscal year ended on Sept. 30 of $30,536,326, and net sales of $427,203,107, as compared with a net profit of $26,299,931 and net sales of $364,193,360 for the previous fiscal year.

Packard Raises Prices on Two Series

Packard has increased its "provisional" prices set on its 300 and 400 series at announcement time in August. The 300 has been increased $100 to $2895 which still leaves it $24 below the corresponding 1950 model. The price of the 400 was increased $110 to $3495, but is still about $80 below the previous comparable model. Crosley has also increased its prices by $52 to $74 on its 1951 models announced about the middle of November.

Ford Boosts Prices of 1951 Models

The Ford Motor Co. has boosted the prices of its passenger cars from 5 to 7.1 per cent, or from $87.50 on Ford cars to $165 on the Lincoln Cosmopolitan. Ford has also announced price boosts of from $75 to $275 on its 1951 model Ford trucks.

Ford has set the price of its new automatic transmission, called the Fordomatic drive, at $159.30 plus Federal excise tax of $9.20. The price is the same as that for the Merc-O-Matic transmission on the Mercury which is essentially the same unit.

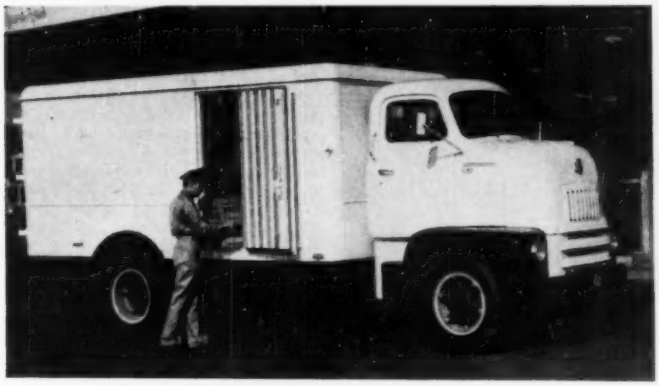
GMC Truck Production Sets Peacetime Peak

GMC Truck & Coach Div. of General Motors, which has undergone a thorough reorganization during the last year, has broken all peacetime production records, turning out more than 100,000 trucks this year. The 100,000 mark was passed five weeks before year-end so that at the end of 1950 the production total will be far beyond the previous peacetime high mark of 92,677 trucks built in 1948.

Aircraft Contracts Head Military Orders

Aircraft orders continued high on the list of contracts awarded by the military with North American Aviation, Inc., receiving a $9 million contract for miscellaneous aircraft assemblies; Lockheed Aircraft Corp., $1 million contract for retrofit kits; and Douglas Aircraft Co., Inc., $1 million for aircraft spare parts. Military and commercial backlogs of the seven major airframe companies on the Pacific Coast stands at more than $2 billion, it was announced by the Aircraft Industries Association.

GM and Chrysler are among 28 companies in Michigan to get additional defense contracts. GM's Chevrolet Motor Div. has an order for 1000 sedans to cost slightly more than $1.3 million. Another GM division, United Motors Service, was given four contracts for engine and engine parts

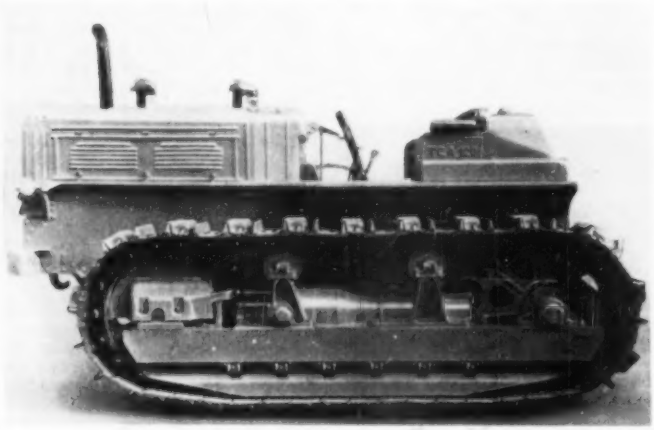


RANGE THROUGH TWO

This International truck Model LC--180 is one of six new cab-forward models introduced by The International Harvester Co. The new models, with short front-bumper-to-back-of-cab dimensions, range through two series, with three models in each. The LC-160 series, powered by the new International Silver Diamond 240 engine, ranges in GVW from 14,000 to 16,000 lb, while the LC-180 series, powered by the International Super Blue Diamond 269 engine, ranges in GVW from 17,000 to 21,000 lb.

amounting to nearly $268,000. Three contracts went to Chrysler for engines, seat cushions and automotive parts in the amount of $1,422,000. Sundstrand Machine Tool Co. received a $1.1 million contract for alternator drives, and Continental Motors Corp. received a contract for engine assemblies totaling $968,700.

The Department of Defense summary of obligations for procurement, July through October, 1950, included the following: aircraft $4357 million; ammunition and guided missiles $755 million; tank-automotive $906 million; and transportation equipment $7 million.



BOUND FOR AUSTRALIA

The Ansaldo Fossati Co. has just built the TCA 120 crawler tractor shown here. About 300 of these units are to be built for Australian farming organizations and road building enterprises in the Australian Commonwealth. The TCA 120 is powered by a six-cyl Alfa Romeo Diesel engine developing 130 hp at 1400 rpm.

Copper Limitation Order to Hit Vehicle Output

While the new copper limitation order is not quite as drastic as had been expected, it is still a severe blow to the automobile industry. The order limits non-defense use of copper in January and February to 85 per cent of the average monthly use during the first six months of this year. In March it drops to 80 per cent of the average monthly use during the base period. Because it is extremely difficult to engineer away from copper in motor vehicles, it is hard to see how result of the order will be anything other than a direct cut in vehicle production. Since the base period is the first six months of this year when production was not as high as it has been during the last half, the cut actually amounts to more than 15 to 20 per cent and probably is closer to 25 per cent.

There is no practical known substitute for copper in such items as starters and generators and the wiring system. Some work was done during the war in substituting steel for copper in radiators, but did not prove satisfactory. One of the reasons was that it was necessary to load the coolant with such a high concentration of corrosion inhibitors that cooling efficiency was greatly impaired. One line of investigation currently underway is the possibility of coating interiors of steel radiators with a phenolic resin to prevent corrosion. Crosley used the process with excellent results in its postwar engine composed entirely of steel stampings. However, in any event, it would take considerable time to install the necessary equipment and work out the production procedures if such a method were to be adopted.

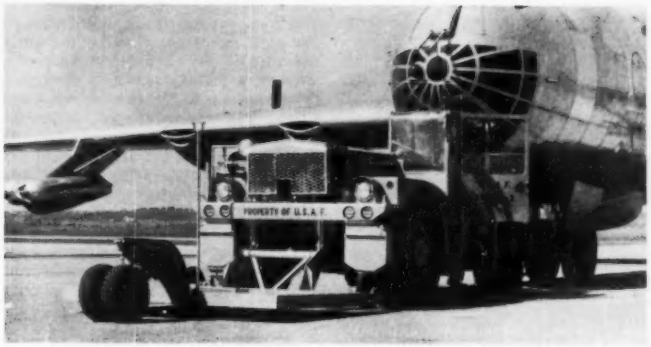
Even if it is possible to reduce the amount of copper used in an automobile there is still plenty of trouble ahead with the aluminum limitation order which is much more drastic, calling for a reduction of 35 per cent. NPA has made certain modifications in the order, but these are not of such a nature as to meet the general criticism of the automobile industry, namely, that the order should apply on the end product so that substitutions can be made to achieve the desired result. There is a great deal of confusion at the moment under the two orders and it will be some time in January before the actual effects on automobile and truck production will be known. However, the outlook is not particularly good at the moment.

Cadillac Announces Its 1951 Models

Cadillac enters the 1951 season with some interesting mechanical changes and improvements. For one thing Hydra-Matic drive has been made standard equipment on all models. In addition, Hydra-Matic drive has been improved by controlling reverse through hydraulic system, thus making reverse a simple finger tip control operation. It also permits rocking the car to get out of ruts and snow. Engine operation has been improved by piston development and still better balance of reciprocating parts and crankshaft. Lubrication of pistons and cylinder walls is also improved. Valve guide contour has been modified to prevent build-up of carbon deposits. A new choke modifier aids in further improving fuel economy. Self-centering brake shoes designed to allow for wear have been adopted. Improved shock absorber valving and repositioned body-mounting brackets promote still better ride. On the interior, instrument panels are new, starter button is eliminated, permitting ignition to be turned on by key, direction signal indicator switch made silent, warning light added to signal hand brake, oil pressure, and generator discharge rate.

NPA and CAB Work Out Aircraft Parts Plan

An agreement has been worked out between the National Production Authority, and the Civil Aeronautics Board to forestall shortages of new transport aircraft and replacement parts. Items of a critical nature which are needed by the airlifts will be assembled and screened by the CAA and submitted to the NPA for necessary action. Likewise, the CAA and CAB will cooperate with the military agencies in programming aircraft and parts production so as to assure an even flow for both defense and civilian needs. The CAA will also take on the job of screening and assisting in programming production of electronic equipment for air carriers.



A TUG FOR THE B-36

Developed by the Air Materiel Command's Equipment Laboratory and designed as a tug for the Air Force's B-36 bomber, this Model A-2 tractor is capable of hauling 400,000 lb. It can turn in an area of less than 17 ft, measures 18 ft long, eight ft wide, approximately six ft high, and the prototype weighs 29,000 lb. The manufacturer of the A-2 is the Euclid Road Machinery Co.

Chrysler and Independents Win Rail Freight Fight

Chrysler, Nash, Packard, Studebaker and Willys-Overland have apparently won a significant victory in their three-year fight to reduce the disparity in rail freight rates on new passenger cars shipped from home factory cities as against lower rates from branch assembly plants. ICC has directed that railroads make downward adjustment on rates on new cars shipped from home factory cities and to fix a minimum rate on cars shipped from assembly plants. The new maximum rate, to take effect Feb. 20, on home factory shipments is 75 per cent of first class rate whereas rates on cars shipped from branch assembly plants can be no lower than 50 per cent of first class. It is estimated that transportation charges from home plant locations will now be about 12 per cent lower. On the other hand, Ford and GM which have branch assembly plants scattered throughout the country will no longer reap the advantages of rates which in some instances were reported to be as low as 30 per cent of first class rates on short hauls.

The complainant companies stated that under the industry policy of charging customers full transportation charges from home factories to point of sale regardless of where the car was made gave Ford and GM a competitive advantage because of their widespread assembly plant system. It is not considered likely, however, that any savings realized from the new rule will show up in new car price reductions in view of increasing costs all down the line. Transportation charges on trucks were not affected by the ruling since ICC stated that sufficient evidence was not available to support any change at this time.

Willys Reports Gain in Export Sales

Willys-Overland reports a strong pickup in export business during the last 90 days. The company says that because of improved foreign exchange, shipments of Willys vehicles to export markets during October were about 30 per cent higher than for the same month a year ago and that new orders were 50 per cent greater than shipments. With orders outstripping shipments during the third quarter, Willys currently has a backlog of unfilled export orders equal to five months production. For the industry as a whole, however, exports are still running at a very low level accounting for only 3.6 per cent of total production for the first 10 months of this year, compared with 4.8 per cent for the same period last year.

Crosley Motors Reports Loss of $846,686

Crosley Motors, Inc. has reported a net loss of $846,686 for the year ended last July 31. The loss was after a carry-back Federal income tax credit of $515,130. During the prior fiscal year, Crosley had a net loss of slightly more than one million dollars after a tax credit of $588,254. Powell Crosley, Jr., president, says that the company expects to reach a break-even point in the near future.

Four Wheel Drive Auto Starts Manufacturing in Canada

Manufacture of motor vehicles has been started in Kitchener, Ont., Canada, by the Four Wheel Drive Auto Co. Ltd., which since 1919 has operated as Canadian sales and service headquarters for the company with head office at Clintonville, Wisc. The decision to convert the plant here for actual manufacture of trucks is partially due to the preference given Canadian-made production on the dominion market. There are as well currency exchange aspects which give a more favorable position to the Canadian-manufactured truck. The Kitchener enterprise will import some of the major truck components not now manufactured anywhere in Canada, but fabricating of many items and many of the incidental parts will be done in Kitchener.

1950 MOTOR VEHICLE FACTORY SALES FROM U. S. PLANTS*

	Passenger Cars	Trucks	Buses	Total Vehicles 1950	Total Vehicles 1949
First Quarter	1,342,803	294,137	551	1,637,491	1,379,703
Second Quarter	1,751,399	360,146	1,278	2,112,822	1,620,810
Third Quarter	1,894,676	351,623	1,277	2,247,576	1,864,583
Total—Nine Months	4,988,878	1,005,905	3,106	5,997,889	4,865,096
October	651,169	108,815	553	760,537	573,489
Total—Ten Months	5,640,047	1,114,720	3,659	6,758,426	5,438,795

1950 DOMESTIC TRUCK FACTORY SALES BY G.V.W.*

	5,000 lb. and Less	5,001-10,000	10,001-14,000	14,001-16,000	16,001-19,500	19,501-26,000	Over 26,000	Total
First Quarter	126,709	57,323	20,036	39,476	9,080	7,447	5,055	265,126
Second Quarter	158,072	65,209	21,510	48,180	11,572	10,427	7,557	322,527
Third Quarter	187,562	60,290	19,790	44,728	11,303	11,939	7,638	313,183
Total—9 Months	443,343	182,828	61,246	132,384	31,955	29,813	20,247	900,846
October	46,700	24,932	5,820	12,073	2,678	3,751	1,933	97,087
Total-10 Months 1950	489,043	207,760	66,266	144,457	34,633	33,594	22,180	997,933
Total-10 Months 1949	400,986	231,889	83,096	122,363	23,456	16,546	12,400	870,734

*—Automobile Manufacturers Association.

NOISE REDUCER

This huge noise-suppression muffler is being built by Northrop Aircraft, Inc., to reduce noise created in the neighborhood by pre-flight engine testing of the USAF's Northrop Scorpion F-89 all-weather interceptors. This artist's conception demonstrates how the entire airplane will be backed up to the silencer while engine runs are in progress. The muffler is being built of porous volcanic ash blocks heavily reinforced with steel I-beams. It measures approximately 95 ft long.

GM Ups Prices of 1951 Models Almost 5 Per Cent

General Motors has increased prices on its passenger cars by a little less than five per cent on 1951 models. The price boost was the first since the fall of 1948. Since that time GM made three price reductions in connection with downward adjustments in its cost-of-living wage formula. According to C. E. Wilson, GM president, the price increase does not fully represent increased costs. He said that prices of materials used in car production have risen from 7 to 300 per cent during this year. He cited the following increases in cost for various items: steel, 7 per cent; aluminum, 11.8 per cent; nickel, 20 per cent; copper, 32.4 per cent; lead, 41.7 per cent; cotton, 44.6 per cent; tin, 66.9 per cent; zinc, 68.5 per cent; wool, 72.4 per cent; and rubber, 300 per cent. He added that cost for wages, pensions and other employe benefits have increased 11.3 per cent this year.

Mathematics Group's Paper Emphasizes Precision Need

A group of papers presented by members of the Industrial Mathematics Society at the University of Detroit recently emphasized the growing need for greater precision in the analysis of practical problems and the role of mathematics in this direction. The specific problem of designing shafts subject to torsional loading, including the important effect of vibratory loads is analyzed in a paper "A General Steady State Solution of the Two-Mass Torsion Problem" by E. F. Riopelle, Morse Chain. P. T. Nims of Chrysler Corp., discussed at some length the possibilities of using calculating machines of punch card type for the solution of otherwise intricate mathematical problems in every day engineering analysis.

The team of E. A. Roach and H. H. Kehrl, General Motors Research, provided a solution for the specific problem of governing the speed of a centrifugal pump so as to produce a given head. The solution proposed by the authors is based upon the principle of dynamic similitude. L. S. Lustick of General Motors Research developed the solution for the problem of determining the outlet pressure of an oil pump necessary to support a stated load on a stationary cylindrical shaft. This was accomplished through an application of Southwell's Relaxation Method to viscous flow. An analytical method for the derivation of gear tooth "X"-factor was demonstrated by Douglas Hughson of Nash-Kelvinator. These papers are of interest primarily because of the application of mathematical techniques and philosophical slant to the solution of specific problems of more than ordinary complexity.

Wages Go Up Again Under Cost of Living Plan

Wage costs for GM, Ford, Packard, Nash, Studebaker and Kaiser-Frazer went up three cents an hour Dec. 1 under escalator clauses in their labor contracts. Previously, it has been thought that the increase would be two cents an hour, but a revision by the Bureau of Labor statistics added 1.3 to the rent component bringing the index to 176.1 requiring a three cent hourly increase. GM had voluntarily added .8 to the BLS index previously to compensate for the understatement in the rent component. GM now recognizes the increase to 1.3 for the forthcoming quarter only. Other companies using the GM formula are also accepting the 1.3 rent basis. The latest increase brings the total of wage increases since new contracts were signed by all the above companies to 11 cents.

CONTRAST IN CELLS

The airplane fuel cell, shown here, with a capacity of 2500 gallons, for the B-47 bomber, is the largest ever manufactured by The B. F. Goodrich Co., Akron, O. It is seven ft high, eight ft, one in. in width and eight ft, nine in. long, while in contrast, the sump cell at lower left, also used in the B-47, holds only two gallons.

INDUSTRIES

RFC Lends Kaiser-Frazer $25 Million

The Reconstruction Finance Corp. has agreed to lend the Kaiser-Frazer Corp. $25 million for working capital and plant expansion. K-F had applied for a loan of $38 million, officials of the lending agency said. In granting the revamped request for $25 million, RFC specified that the firm must cut its production of automobiles to 600 units a day by Jan. 1. In addition, the company may not increase its prices above the Dec. 1 level without the government's permission, and must also make every effort to obtain war contracts and give those priority over automobile production.

The loan is to be secured by new Kaisers and Henry J's stored in bonded warehouses. RFC officials said about 13,000 Kaisers and about the same number of Henry J's would be held as security. As the cars are withdrawn from storage, the entire wholesale price is to be paid the RFC. Of that sum, 90 per cent will go toward repayment of the loan and 10 per cent will go toward repayment of a $10 million revolving loan previously granted.

Union Asks Protection of Men in Service

The UAW-CIO has drawn up a list of seven demands which it is asking local unions to insert in their collective bargaining agreements to protect union members who are now in or may be called into military service. The seven points are: reemployment rights for returning servicemen, regardless of type of discharge issued them by military services; reemployment rights for probationary employees; returning servicemen be guaranteed promotional opportunities granted during absence into the armed services; vacation pay for year of entrance and year of return from service; pension credits for time spent in military services; continuation of life, hospitalization and surgical insurance benefits during member's military service; and establishment of Labor-Management Military Deferment Committee.

Buick Plans Addition to Flint Foundry

Buick will soon start construction of a 170,000 sq ft addition to its present foundry at Flint. The most modern equipment will be installed for ventilation, lighting, and elimination of dust. Air will be washed and changed once a minute. Completion of the project is expected by next May.

New Truck Registrations to Set Record in 1950

It is now certain that 1950 will wind up as the highest year in history in new truck registrations and second best in production. At the end of September new truck registrations totaled 867,785 with only 167,389 more needed to equal the previous high mark of 1,035,174 registered in 1948. Registrations would have to average only 56,000 a month for the last three months of the year to beat the old record and, of course, they are going to do much better than that. Production this year is expected to be approximately 1,250,000 units. At year-end total truck registrations in the U. S. are expected to be 8.7 million units, an all-time high.

Midland Manufacturing Buys Starbilt Rights

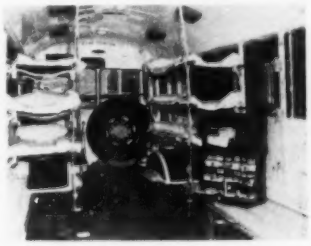
The Midland Manufacturing Co., Wichita, Kans., recently announced the purchase of all rights to the manufacture of Starbilt storage equipment formerly produced by the Star Manufacturing Co. of Oklahoma City, Okla., at their plant in Kansas City, Kans. A modern steel building with 15,000 ft of floor space is presently under construction in Wichita and full production is expected by the first of the year. Midland will continue to manufacture storage equipment under the trade name Starline.

Ingersoll Steel Divided Into Two Divisions

Borg-Warner has separated its Ingersoll Steel Div. into two independently operated units. One will continue to be known as the Ingersoll Steel Div. with Harold G. Ingersoll as president and general manager. The other division will be known as the Ingersoll Products Div. with plants in Chicago and Kalamazoo, Mich. Robert S. Ingersoll will be president and general manager.

Chrysler Offers New Traffic Safety Film

The Chrysler Corp. has come up with a new and different type of traffic safety film. The unusual approach of the film lies in its use of highly dramatic devices in the form of a fantasy to show that "safety is everybody's business." The plot revolves around an outstanding safety patrol boy who becomes involved in a driver-pedestrian accident and shows the resulting effect on the community and family. The film is an unusually good one from the standpoint of content, continuity, photography, and dramatic technique. Showings will be under the auspices of Plymouth and the film will be available to schools,



BUILT BY BRILL

This new model C-44 ambulance type coach is being built by ACF-Brill Motors Co., for the U. S. Air Force Medical Service, Detroit Ordnance District. Priced at about $16,000, the bus has a wheelbase of 249 in., an overall width of 96 in., and is powered by a six-cyl Hall-Scott engine developing 208 hp at 2200 rpm. In addition to the nurse the bus can carry 18 litter cases.

MODERN GROUP

This is a model of the Ford Motor Co.'s modern office building group to be built in Dearborn, Mich. An 11-story building to house the central staff offices of Ford and an adjacent six-story building for Lincoln-Mercury administrative offices are planned.

luncheon clubs and other organizations.

No Plans Yet To Cut Travel

Reports from Washington indicate that at the present time there are no serious plans to curtail civilian travel or to impose gasoline rationing. The present supply of fuel is adequate to meet all civilian and military demands. Future supplies will depend upon military developments and the ability of refineries to meet defense requirements along with high civilian demand.

Ford of Canada to Build New Parts Center

The Ford Co. of Canada has announced plans for a $1 million parts and accessories supply center to be built in Montreal next year. The new depot, to be constructed on Cote de Liesse Road, will serve most of Quebec and parts of Eastern Ontario. It will occupy a 10-acre site and will be one story, of steel frame and brick construction.

New Car or Truck Sold Every 1.2 Second

Every 1.2 second of each business day a new motor vehicle is sold in the United States, according to R. L. Polk & Co., Detroit statistical agency. The calculations are based on new car and truck registrations for 10 months plus a forecast figure for November and December. Polk estimates that by the end of this year new car registrations will total 5.9 million and trucks 1.1 million for a total of about 7 million for the year.

Traffic Death Toll Up 11 Per Cent

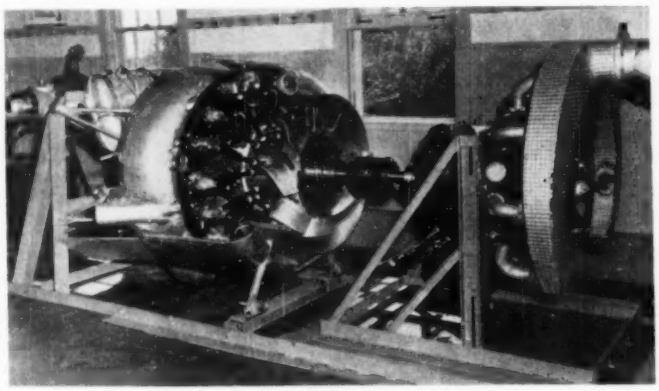
The National Safety Council has reported some rather chilling statistics on highway accidents this year. The council says that in the first nine months of 1950, traffic deaths increased 11 per cent to a total of 24,580. It says further that the total will reach 35,000 by year end, the highest in 13 years with the exception of 1941. It says further that 60 million licensed drivers will drive approximately 450 billion miles this year, resulting in more than 15 million accidents which will have a total cost of almost $3 billion.

To Hold Paris Air Show from June 15 to July 1

Paris is planning an aeronautical exhibition from June 15 to July 1, to be held in the Grand Palais, the nearby Esplanade des Invalides, and Le Bourget airfield. While the main exhibition will be in the Grand Palais—including engines, sections of planes, and the smaller planes—the bigger airplanes will be in the open air on the Esplanade, while the airfield will be made use of for flying demonstrations. The only international display of its kind in Europe, it is organized by the Union Syndicale des Industries Aeronautiques of Paris.

Machine Tool Builders Get Few DO Orders

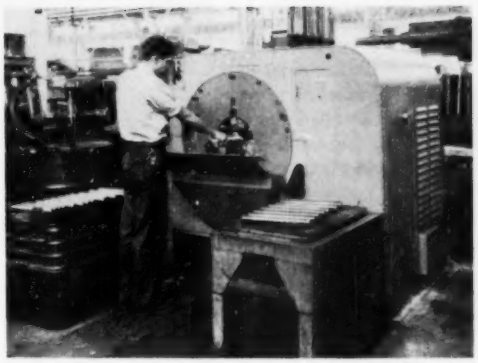
Machine tool builders report that DO orders are starting to show up on their books. The industry has boomed in recent months, but up to the present orders have been largely from civilian



CONSTANT INDICATION

Used in the aeronautical engineering laboratory of the University of Oklahoma, Norma, Okla., is this combination of a nine-cyl. 450-hp radial aircraft engine (left) driving the supercharger section from an 18-cyl radial aircraft engine (right) through a Baldwin SR-4 Torquemeter which gives a constant indication of horsepower output.

customers. Unfilled orders are four times as high as they were a year ago with the ratio of backlog to shipments almost 12 to 1. Machine tool men say that because of the peculiar nature of their production schedules, DO orders are a headache. The reason is that machine tools are not mass produced, but are built in lots and an order calling for immediate handling of a DO ordered machine might upset the whole scheduling program. Manpower is also becoming an increasing problem because when the industry was in the doldrums earlier this year, much of the skilled help was laid off and lost to other industry, and now it is particularly difficult to replace.



CUTS COSTS

The Eddystone Division Shops, Baldwin Locomotive Works recently installed a Reed A32 Cylindrical Die Thread Roller for rolling Class 5 thread up to 1⅝ in. diameter on cylinder head studs and connecting rod bolts used in their Diesel locomotive engines. Manufacturing savings with the Reed Thread Roller are said to have amounted to over 50 per cent of the total cost of the bolts and studs.

U. S. Rubber Consumption Hit All-Time High in October

For the sixth consecutive month, rubber consumption in the United States exceeded 100,000 tons with October reaching the new all-time high of 117,935 long tons, according to the monthly estimate of the Rubber Manufacturers Association, Inc. The October figure is 8.73 per cent higher than the September consumption of 108,464 long tons, and is about 3000 tons higher than the previous record of 114,676 long tons set in August of 1950. Consumption of natural rubber during October amounted to 67,236 long tons, an increase of 12.35 per cent over September when 59,846 long tons were used, and almost 5 per cent higher than August when the consumption totaled 64,297 tons.

Use of synthetic rubber totaled 50,699 tons, up 4.28 per cent from September when 48,618 tons were required. Total new rubber consumption for 10 months in 1950 went over the million mark with 1,045,209 tons being consumed. This compares with the total year 1949 consumption of 988,903, and indicates the extremely high level of industrial activity in the rubber manufacturing industry.

FIRST IN EIGHT

What is described as the largest mobile aircraft heating and air conditioning unit ever used by a commercial air line is shown borne on the chassis of an International Harvester LC-160 cab-forward truck. The new cab-forward models are the first to come off International's production lines in eight years. The conditioner was specially designed for servicing United Air Lines' big four-engine Mainliner passenger planes.

NSPA Names Tapscott President

Members of The National Standard Parts Association, meeting in Chicago for their convention on Dec. 1 and 2, elected Charles C. Tapscott, vice president and sales promotion manager of McQuay-Norris Manufacturing Co., St. Louis, Mo., to the post of president for the coming year. He succeeds G. Walter Kleinschmit, an executive of the Automobile Equipment Co., Detroit, Mich., who becomes an ex-officio member of the board of directors for next year.

Also elected to the top posts of NSPA for the coming year are: Fred S. Roberts, president and general manager of Phelps-Roberts Corp., Washington, D. C., to the office of senior vice president. Prior to his election to this office, Mr. Roberts served as junior vice president in 1950, as a director for NSPA in 1943, 1944, and 1945, as well as on various standing committees. Charles A. Klaus, sales manager for Maremont Automotive Products, Inc., Chicago, Ill., was elected junior vice president. He has previously been a director, member of the Marketing Research Committee, and on various other Association committees. Three manufacturers were elected to the board to succeed directors whose terms expired in 1950. They are: Fred S. Durham, Jr., Bonney Forge & Tool Works, Allentown, Pa.; L. M. Olson, R. M. Hollingshead Corp., Camden, N. J.; and Ira Saks, Accurate Parts Manufacturing Co., Cleveland, O.

Is this any way to talk to a lady?

MAYBE the gals-at-the-wheels *aren't* all breathless to hear about your car's stroke, bore and piston displacement.

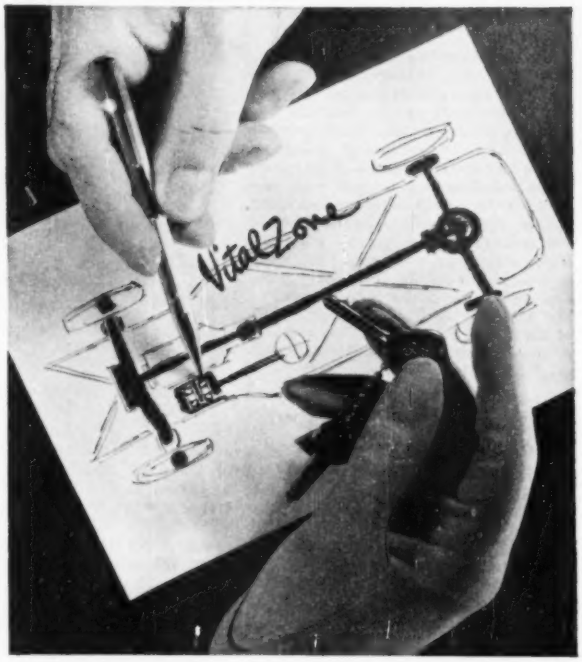
But they don't have to be engineering-minded to care about *value*. Care-free, trouble-free, *safe* performance is what they want most. And in the months ahead that, more than any other factor, is going to be the making, or the breaking of a lot of friendships.

How can you be sure of getting value where it counts most—in moving parts, the "vital zone"? You may find it a help to keep this simple, but easily overlooked formula in mind:

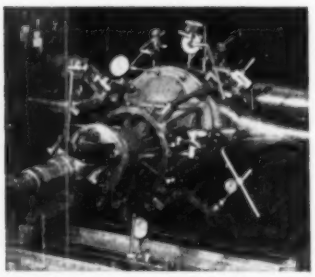
$$Value = \frac{quality + service + public\ acceptance}{price}$$

Obviously a *big* advantage *above* the line gives you more value than a *small* one below. No other bearing can match Timken's uniform high quality, extensive and varied service support, and overwhelming public acceptance.

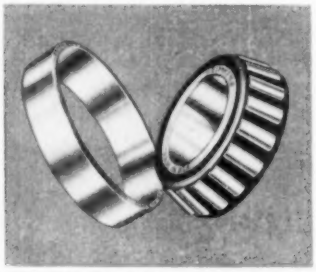
Over the years Timken® has led in lowering prices. And in terms of value features, Timken prices are lowest today. The Timken Roller Bearing Company, Canton 6, Ohio.



How TIMKEN® gives you value where it counts most . . . in the "vital zone":



RESEARCH on general automotive problems is an extra Timken service available to automobile manufacturers. For example, Timken introduced the gear deflection test, the 4-square test, and helped develop EP lubricants.



ONE EXAMPLE of Timken value is in the pinion—toughest bearing application on a car—where all but two makes of autos use Timken bearings for long, trouble-free operation. Timken sets the performance standard other tapered roller bearing manufacturers try to follow.

ONLY TIMKEN GIVES YOU ALL THESE VALUE FEATURES

QUALITY

1. Design leadership
2. Steel made in our own mill
3. Precision manufacture
4. Rigid quality control
5. 50 years experience

SERVICE

6. Unequalled engineering service
7. Unequalled research and development facilities for your use
8. Installation service in the field
9. Widest range of sizes
10. Most dependable source of supply

PUBLIC ACCEPTANCE

11. First choice throughout industry
12. Best-known name in bearings
13. Widespread advertising

it's TIMKEN for VALUE

TAPERED ROLLER BEARINGS™

NOT JUST A BALL ○ NOT JUST A ROLLER ⊂⊃ THE TIMKEN TAPERED ROLLER ⊂⊃ BEARING TAKES RADIAL AND THRUST →← LOADS OR ANY COMBINATION

Men in the News

Current Personnel Appointments and Changes at Plants of Automotive Manufacturers and Their Suppliers.

Bendix Aviation Corp., Eclipse-Pioneer Div.—Arthur E. Raabe has been appointed general manager.

General Motors Corp., Buick Motor Div. — Harry L. Brodbeck has been named director of car distribution.

Borg-Warner Corp., Rockford Clutch Div.—Harry L. Emerson has been appointed vice-president in charge of manufacturing. He also will continue as works manager.

Monroe Auto Equipment Co.—**George J. Henrich** promoted to vice president in charge of purchasing; **George M. Streicher** to vice president in charge of manufacturing, and **C. J. Smith**, who left Packard in 1944, as engineer in charge of the Packard proving grounds, to vice president in charge of engineering.

The Yale & Towne Manufacturing Co.—**Foye F. Staniford**, president of the Westchester Surface Ways, Inc., Mt. Vernon, N. Y., was elected a director.

The Trailmobile Co. — **S. E. Biggs**, Cincinnati and **James A. Bardsley**, Berkeley, Calif., have been elected vice-presidents.

Piasecki Helicopter Corp. — **Ernest Wenigmann** has joined the company as vice-president of manufacturing.

Kaiser-Frazer Corp.—**F. L. McClure** has been named director of fleet sales.

Chrysler Corp., Dodge Div.—**William S. Woolsey** has been appointed assistant director of truck sales.

United Aircraft Corp., Pratt & Whitney Aircraft Div.—The appointment of **Leete P. Doty** as superintendent of the company's Southington, Conn., plant has been announced.

Borg-Warner Corp., Ingersoll Steel Div.—**Richard Brown** has been named director of personnel at Kalamazoo, Mich.

The Industrial Tape Corp. (subsidiary of Johnson & Johnson)—**J. S. Nicholls, Jr.**, has been appointed chairman of the board, and **Edwin J. Fitzpatrick** named president.

General Motors Corp., Chevrolet Motor Div.—**F. V. Seely** has been named assistant manager of the Chevrolet parts and accessories warehousing department.

Fansteel Metallurgical Corp.—**Major General Clinton F. Robinson** and **Duncan C. Menzies** have been elected directors.

Clark Equipment Co., Industrial Truck Div.—**Milton G. Peck** has been appointed sales manager.

E. W. Bliss Co., Canton Div.—The appointment of **C. R. Brown** as purchasing manager has been announced.

Acme Steel Co.—**James J. Filas** has been appointed manager of the newly-created Fastener Dept.

Kropp Forge Co.—**R. E. Moore** has been elected to the board of directors.

Chrysler Corp., Export Div. — **E. E. Thompson** has been appointed special assistant to the president, **C. B. Thomas. Philip K. Hills** has been appointed to the newly-created post of sales manager, in complete charge of all sales activities throughout the foreign field. **George B. Fraumann** has been appointed general parts manager.

Purolator Products, Inc. — **Frederick P. Babcock**, formerly a sales engineer, has been appointed assistant sales manager in charge of aviation, government and export equipment sales. **S. B. Wanner**, of the Chicago sales office, has been appointed assistant sales manager for all other equipment sales.

The Four Wheel Drive Auto Co. — **H. G. Engel**, manager of FWD's Western sales zone, has been appointed office sales manager, and **V. M. Anderson**, district sales supervisor in Northern Ill., was named to fill the vacated zone managership.

Plomb Tool Co.—**Lawrence M. Rich** has been appointed vice-president and general sales manager.

Dearborn Motors Credit Corp. (subsidiary of Dearborn Motors Corp.)—**George Herbert Zimmerman**, Detroit, has been named consultant.

E. I. du Pont de Nemours and Co.—**James S. Denham**, general manager of the company's Photo Products Dept., was retired. He has been succeeded by **Samuel G. Baker**, formerly general manager of the Electrochemicals Dept. The vacancy left by this transfer was filled by **Donald O. Notman**, assistant general manager under **Mr. Baker. Dr. Bruce S. Farquhar**, who has been affiliated with the Acetate Div. of the company's Rayon Dept., has been made assistant manager of the acetate fabric development section.

Necrology

James E. Hale, 66, president-elect of the Socety of Automotive Engineers, and chief engineer, Tire Div., Firestone Tire & Rubber Co., died on Nov. 28 in Akron, O.

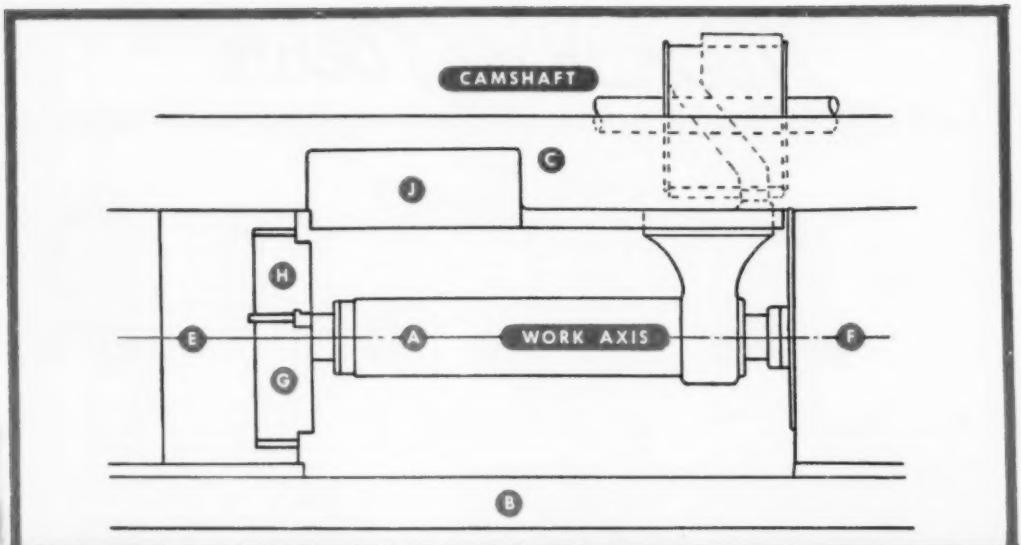
Walter Beech, 59, founder and president, Beech Aircraft Corp., died in Wichita, Kans., on Nov. 29.

Ludwig W. Jacobson, 73, former superintendent of the Chevrolet experimental division of General Motors Corp., died recently in Bradenton, Fla.

Pierre Boulanger, 66, general manager of the Andre Citroen Automobile Co., was killed on the road between Paris and Clermont-Ferrand recently.

Henry T. Kuhlman, 63, project engineer at the Budd Co.'s Hunting Park Plant, died on Nov. 17 in Philadelphia, Pa.

Curtis Q. Smith, 65, formerly manager of replacement sales, American Brakelock Div. American Brake Shoe Co., died in New York Nov. 16.



THE *good* THAT MEN DO

The horizontal design Tooling Area, shown above, is a contribution by Frank L. Cone to the improvement of the Multiple Spindle Automatic Bar Machine that will live long after him. The advantages, stated below, are made possible by the machine's Overhead Camshaft. Specific data invites comparison.

THE TOOLING AREA OF THE CONOMATIC (1½" Six Spindle):

1. **Handles longer work than can be handled by the tooling area of any other "automatic."**

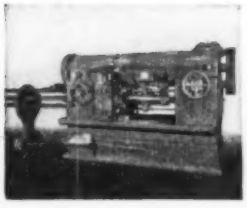
   The length of the Tooling Area is 46 1/16 ins., which permits standard machining operations on work up to 18 ins. in length from the face of the cut-off tool.

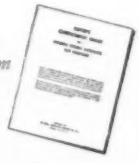
2. **Is more strongly supported by the machine frame than is the tooling area of any other "automatic."**

   The stocky Uprights, E and F, which are shorter than those of other "automatics," are securely bolted to — and held between — the Top Bed, C, and Base, B, which are larger and heavier than such members of other "automatics." *The Uprights are 22" high. The Top Bed is 8" high, 23" wide and 103¼" long. It weighs 1232 lbs. The Base is 33⅜" high, 46" wide and 110" long. It weighs 6655 lbs.*

3. **Provides more Tooling positions than does any other "automatic."**

   The Main End Slide, A, has 6 positions. The Main Cross Slides, G and H, front and rear, have 6, and the Auxiliary Cross Slide, J, front and rear, are 2 more, which make a total of 14.

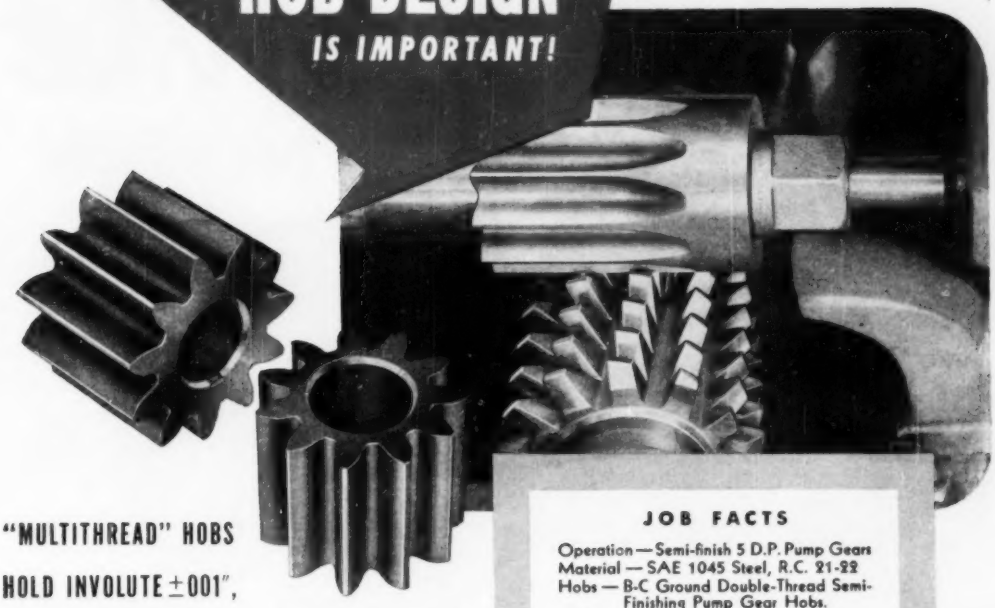


Buyer's Comparison Chart will guide you to full information

A Comparison of ALL Automatics is in Favor of Cone

Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

Good HOB DESIGN IS IMPORTANT!



"MULTITHREAD" HOBS HOLD INVOLUTE ±.001", PRODUCE 20 GEARS PER HOUR.

JOB FACTS

Operation — Semi-finish 5 D.P. Pump Gears
Material — SAE 1045 Steel, R.C. 21-22
Hobs — B-C Ground Double-Thread Semi-Finishing Pump Gear Hobs.
Feed — .045"/rev.
Speed — 160 RPM
Production — 20 gears per hour
Accuracy — Involute ± .001"
Hob Life — 120 pieces per sharp.

Take these pump gears, for example. Their efficiency depends upon how *accurately* they can be produced; their cost on how *fast* they can be produced.

Accuracy, of course, depends on machine conditions too, but it is difficult to produce tolerances in the work which are not present in the tool itself. Nor can quality gears be hobbed at a fast rate if the tool isn't built and designed to take the pace.

The basis of satisfactory gear production is *good hob design.* It saves money, grief and tool life, while guaranteeing the quality of work desired.

Send your hobbing problems to Barber-Colman engineers for recommendations. The importance of Good Hob Design will soon be evident in production gains.

CHECK THIS DATA

Send for new release on Production Increases Gained Through Use of "Multi-Thread" Hobs. Ask for Bulletin 7650.

Barber-Colman Company

GENERAL OFFICES AND PLANT, 7650 LOOMIS ST., ROCKFORD, ILLINOIS, U. S. A.

Nearly 2,000 Nails per minute

FMC Industrial Nailing Machine is known as "the hammer with 24 heads" for its high capacity.

The Twin Disc Model CL Duplex Clutch acts both as an engaging and disengaging mechanism and as a positive brake to control the potential 80 strokes per minute cycle of the Nailing Machine.

This hammer has 24 heads—geared to operate at 80 strokes a minute. *Every* stroke is an operator-actuated connect and disconnect. At the rate of four strokes every three seconds, the punishment the *clutch* must handle is nothing short of amazing.

That's why on its latest model Industrial Nailing Machine, the Food Machinery and Chemical Corporation selected a Twin Disc Model CL Duplex Clutch.

This clutch, with its positive action, is one reason why the Nailing Machine is rated with a high capacity. For the nail chucks and driving assembly are released from the nailed object immediately after each nailing stroke, enabling the operator to index the work through the machine for successive nailing operations.

For assured customer satisfaction on the machines you design and build, always specify Twin Disc Clutches, the result of 32 years of specialization in the design, manufacture and application of power transmission units.

TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES

Clutches & Hydraulic Drives

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois

BRANCHES: CLEVELAND • DALLAS • DETROIT • LOS ANGELES • NEWARK • NEW ORLEANS • SEATTLE • TULSA

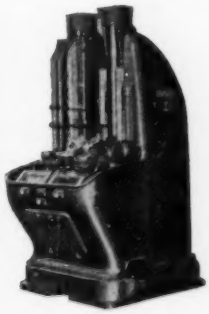
LATEST *Surface Broaching* METHODS ON CAST IRON PARTS

● Many small and medium size cast iron parts are now being surface broached at great advantage on Footburt Machines. With the single slide and duplex vertical machines built in four sizes with several broach lengths and the continuous type offered in four sizes, the proper machine for most any capacity or production is available. Footburt Engineers have a wide experience in development of tooling for speedy operation and accurate locating on all types of parts. Send blueprints for advice on the possibility of using Footburt machines on your work.

THE FOOTE-BURT CO. • Cleveland 8, Ohio
Detroit Office: General Motors Building

Continuous Type Broaching Machine. Made in 4 Sizes.

Single Slide Surface Broaching Machine. Made in 5, 10, 15 and 25 Ton Sizes



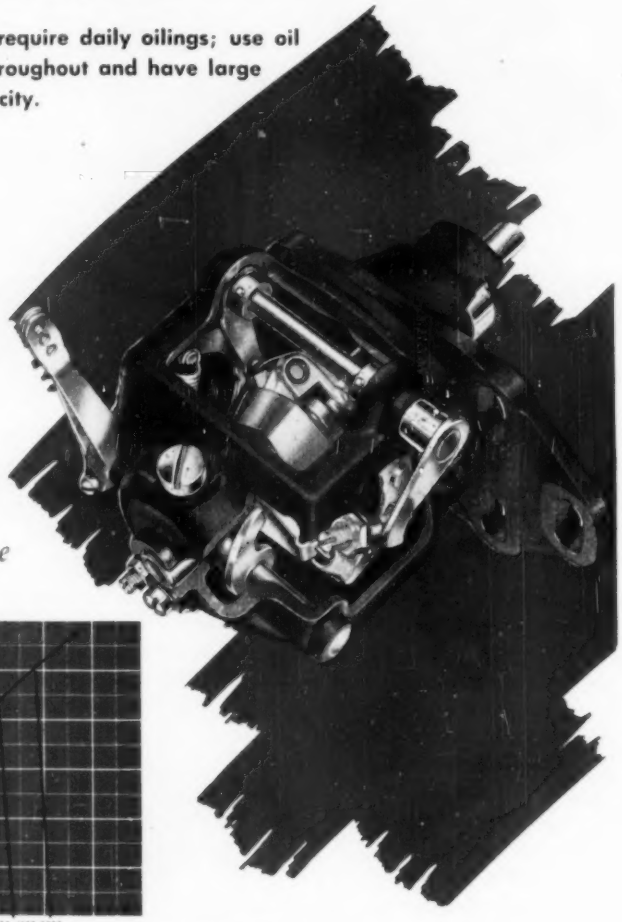
Duplex Surface Broaching Machine. Made in 5, 10, 15 and 25 Ton Sizes.

FOOTBURT . . . *a time tested line of machine tools*

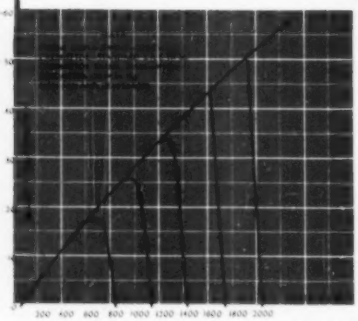
INVESTIGATE *Surface Broaching* FOR DIFFICULT MACHINING WORK

HOOF MECHANICAL GOVERNORS.....

1. Provide close regulation over wide operating range, *without spring change.*
2. Employ ball or roller bearings at all load points.
3. Do not require daily oilings; use oil seals throughout and have large oil capacity.



This is the Performance Graph



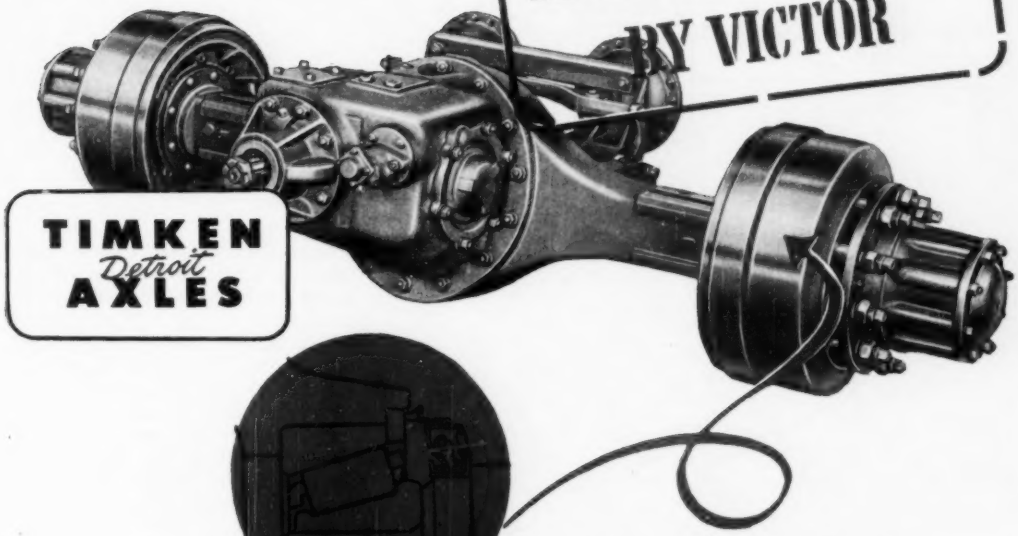
CORRESPONDENCE IS INVITED

HOOF PRODUCTS COMPANY

6543 South Laramie Avenue, Chicago 38, Illinois

GOVERNORS • VELOCITY AND CENTRIFUGAL TYPES • HYDRAULIC VALVES FOR AIRCRAFT

SEALED TO ORDER BY VICTOR



OIL SEALS PRECISELY MADE TO YOUR SPECIFICATIONS!

Not many bearing seal specifications are more exacting than those for heavy duty truck axles. Yet, manufacturing to such specifications —as we're doing for The Timken-Detroit Axle Company—is the class of work we like best. It falls right in with the year-in, year-out tempo in Victor plants—close tolerance manufacturing to the highest quality standards. It's the backbone of Victor's leadership in automotive sealing products.

AXLE SEALING AT ITS BEST —WITH VICTOPRENE

Patented by Timken-Detroit, and made only by Victor, this inner axle seal fulfills every intent of its designer and user. Installed as a 2-piece assembly, the unit permits renewal of wearing parts and protects the seal from damage when servicing axle. Victoprene sealing element gives maximum efficiency to the flex joint.

A COMPLETE SERVICE TO AUTOMOTIVE INDUSTRIES

Whether you write the specifications or invite us to work them out with you, Victor places unmatched sealing experience at your disposal. 55 basic patents testify to Victor's grounding in modern oil seal design, including development of Victoprene—the now universally used Victor sealing element. Victor engineering service includes all laboratory facilities, also dynamometer testing.

Where can we help you to better sealing?

Victor Manufacturing & Gasket Co., *and its affiliate* Victor Sealing Products Co., Inc., P. O. Box 1333, Chicago 90, Ill.

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GASKETS AND OIL SEALS
SEALING PRODUCTS THROUGH RESEARCH

VICTOR

"ORIGINAL EQUIPMENT"

Gaskets and Oil Seals

SEALING PRODUCTS EXCLUSIVELY

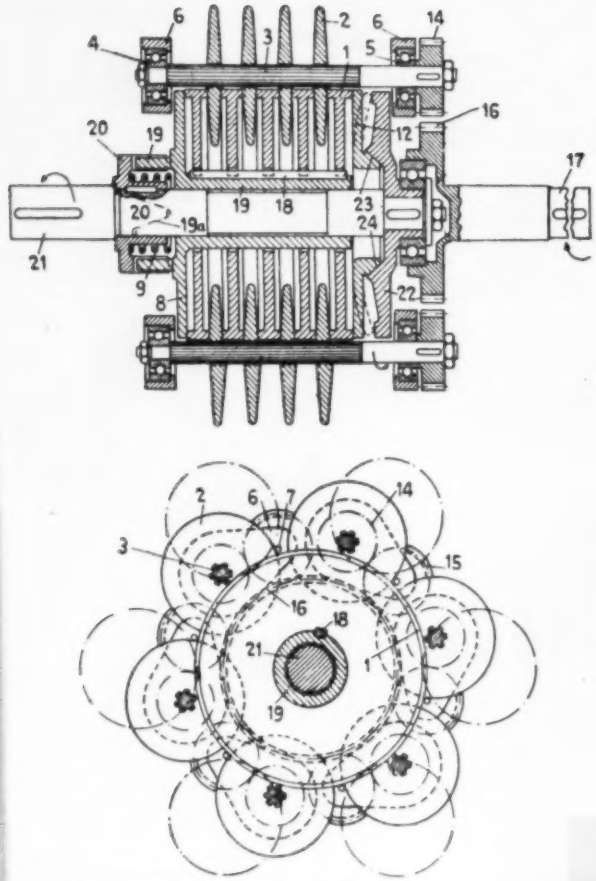


Fig. 1—Arrangement of parts in a single form of the Beier gear.

Infinitely

By W. F. Bradley

Special European Correspondent for
AUTOMOTIVE INDUSTRIES

London, England

AN infinitely variable gear operating on the principle of power transmitted through the drag force in thin films of oil, interposed between the driving and the driven members, is being promoted in England and, it is claimed, will shortly appear on a British motor bus.

The gear is the invention of Dr. Josef Beier, who for some time was associated with Dr. Porsche, designer of the German Volkswagen. The gear was used on this car and ran 15,000 miles. War conditions interrupted development work.

For automobile application the Beier gear is usually mounted in the clutch housing and takes the place of a conventional clutch. The flanged disks are connected to the output shaft of the transmission and the tapered disks rotate around them in a planetary manner. Relative speed of the output shaft varies according to depth of engagement of the disks, and this is automatically adjusted according to engine speed and output torque. When output shaft speed approaches within 15 or 20 per cent of engine speed, direct drive is automatically engaged and the whole assembly rotates as a single unit without any relative motion between the disks. The transmission can give an infinitely low ratio and even go beyond to a negative ratio for reverse, thus eliminating the need for separate reverse gears.

Arrangement of disks, gears, shafts, and arms in a simple form of the Beier gear is shown schematically in Fig. 1. Flanged disks (1) connected to the output shaft engage tapered disks (2) which are mounted on splined shafts

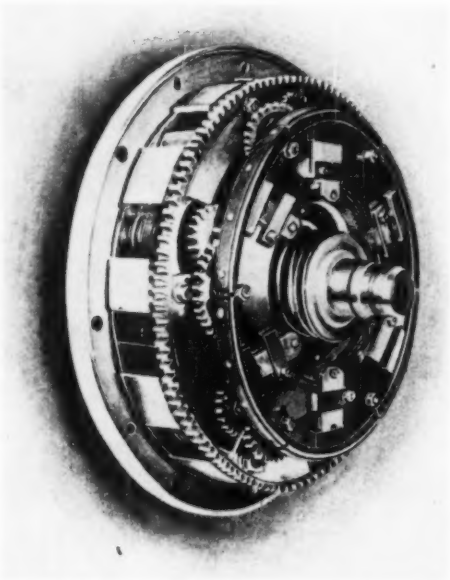


Fig. 2—This gear assembly for a 25-hp engine is 12 in. in diameter.

Variable Mechanical Transmission

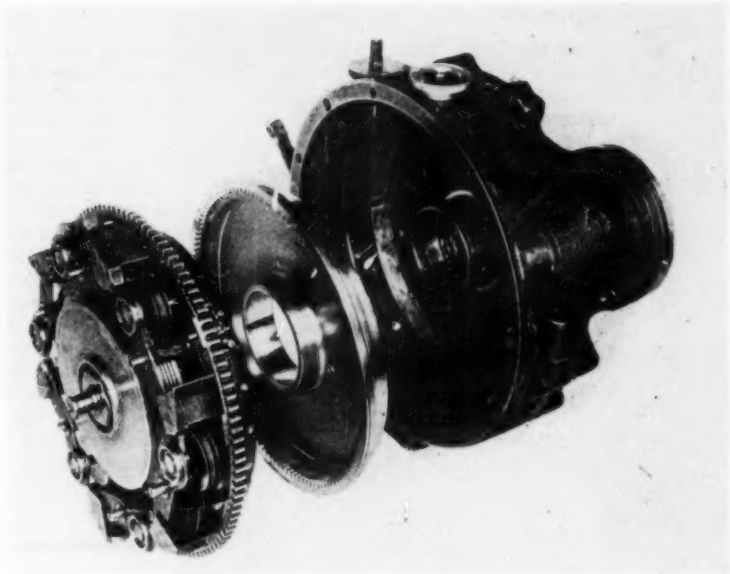


Fig. 3—Partially disassembled gear for use with a 25-hp engine.

(3). Gears (14) at the end of the splined shafts mesh with idler gears (15) which are concentric with pivots (7) carrying arms (6). With this arrangement, idler gears remain in constant mesh with a gear (16) regardless of motion of the swinging arm assemblies as they move to vary the depth to which tapered disks are inserted between flanged disks. Pressure on flanged disks is provided by a spring (9) and by face cams (19) and (20), pressure of the latter depending upon the torque transmitted to the output shaft (21). End plates (8) and (12) apply pressure of the spring and face cams at the rims of the flanged disks. In operation, counterweights (not shown) at the ends of arms (6) not only counteract centrifugal force acting on the tapered disk assemblies, but are sufficiently heavy to move the disks inward toward the center of the transmission with a force which increases with engine speed. Axial thrust produced by the face cams has an opposite effect as it presses the flanged disks together in proportion to torque applied to the output shaft, and this pressure tends to squeeze the tapered disks out of mesh against the centrifugal force created by the counterweights. The face cams function in both directions of rotation and are therefore effective when reversing or when the car is overrunning the engine.

Actually the transmission for use in an automobile incorporates other elements than those shown in the schematic illustration and location of some of the parts is not exactly as shown. A Beier gear for an engine developing 25 hp at 3000 rpm is illustrated in Fig. 2 and Fig. 3.

The Beier transmission can be entirely automatic, or it can be maintained in direct drive by the operator. This makes it possible to take a gradient in high as long as is desired, or to change to indirect, when the transmission automatically adjusts its ratio so that the engine speed remains practically constant.

Free wheeling is provided, but the engine can be used as a brake. Control can be reduced to accelerator and brake pedal. It is claimed that the mechanical efficiency of the gear reaches 95 per cent just before the drive becomes direct.

Manufacturing advantages claimed for it are that it is housed entirely within the flywheel; the space usually occupied by the gearbox is saved, giving a short drive to front or rear axle; the weight of the flywheel is usefully employed; the parts are suitable for quantity production, and the capacity of the transmission can be increased either by increasing the number of disks on each swinging arm, or by increasing the number of swinging arms.

The gear has been used for driving generators on aircraft, and also for superchargers as well as being applicable to automobiles and buses.

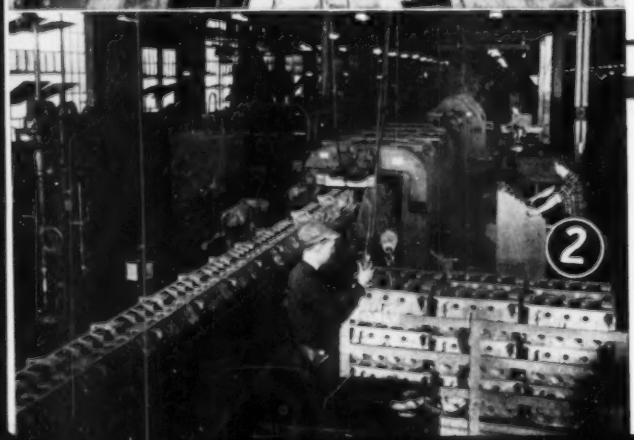
Studebaker's *Modern Equipment*

By Joseph Geschelin

A FAIR percentage of the $20-million expansion and tooling program recently undertaken by the Studebaker Corp. was consumed in providing the outstanding machine shops for manufacturing the new V-8 engine described in AUTOMOTIVE INDUSTRIES, Nov. 1, 1950.

Considering the enormous detail involved in tooling an entirely new engine, this study is intended to cover only some selected highlights in brief fashion. Before proceeding with the case studies, of operations on the block and heads, it is of interest to mention that the V-8 line includes some noteworthy transfer machines supplied by Greenlee, Ingersoll, Foote-Burt, Cross, W. F. & John Barnes, Snyder, and Baker Bros. The latter is the first transfer machine made by Baker to be noted by the writer. In addition, the machine lines for the cylinder block and cylinder head feature two stages of enormous Cincinnati surface broaching machines, in each case, and represent the first instances noted by the writer of such equipment tied in directly as an integral part of formal transfer lines.

Starting with the V-8 cylinder block, initial operations are handled in the battery of two horizontal Cincinnati tunnel type surface broaching machines, extending 100 ft in length including feeder conveyor sections. Both machines are tied to-



Operations on 14-Station

Station	Unit	Operation
1		Load.
2	1	Drill 12 holes, 8 being 1 1/32 in. diameter.
	2	Same as unit 1.
3	3	Drill three holes, one being 4¼ in. deep.
	4	Same as unit 3.
4	5	Drill four holes, one 5⅜ in. deep.
	6	Drill four holes, one 5½ in. deep.
5	7	Drill 10 holes.
	8	Drill 11 holes, one 7-in. deep.
6	9	Drill two oil holes.
	10	Drill 21 holes.
7	11	Drill two oil holes.
	12	Drill 16 holes.

1 *Some impression of the expanse and complexity of the Footburt transfer machine line on the cylinder head may be gained from this partial view of the installation.*

2 *Perspective of the two Cincinnati tunnel broaches at the head of the cylinder block line. Rough blocks are fed to the first operation surface broach on the conveyor in the foreground.*

for V-Eight Engine Production

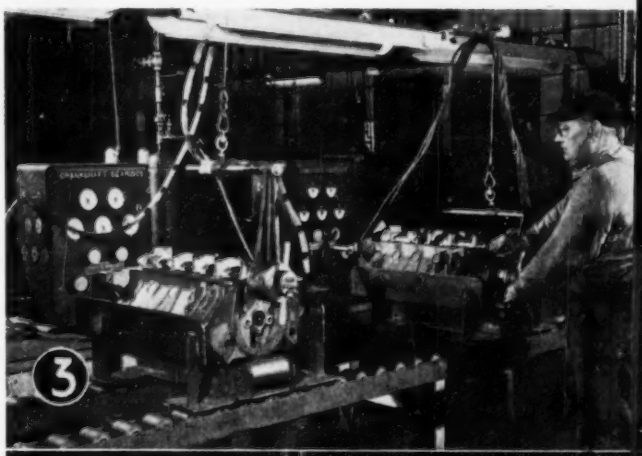
Part One

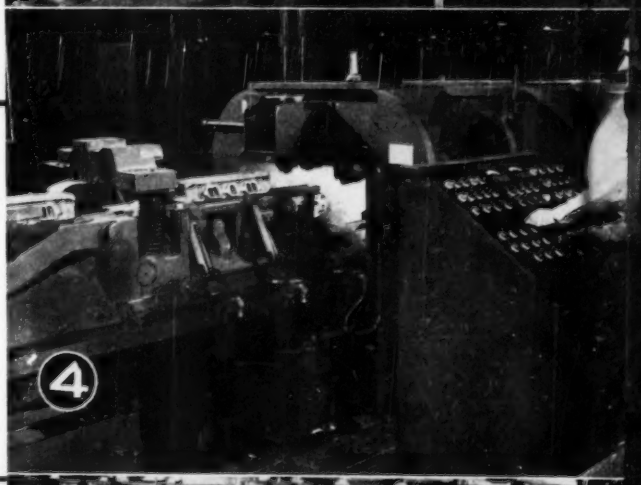
gether with transfer mechanism, and feed the succeeding group of Ingersoll transfer machines in a continuous cycle. Each machine is provided with broaching tools fixed in the upper section, the work being moved under the broaches by the transfer mechanism at the rate of about 120 fpm. In keeping with latest Cincinnati practice, all of the tooling in the broaches is of cemented-carbide, using individual carbide tools for roughing and blocks of carbide blades for finishing sections.

The first of the Cincinnati broaches finishes the pan rail and pan rail bearing locks and main bearing half-bores. Then the work goes into a turnover fixture, indexing 180 deg to present the cylinder head surfaces to the second Cincinnati broach where the two cylinder head faces

Greenlee Transfer Machine

Station	Unit	Operation
8	13	Drill one hole 4⅞ in. deep, one spotface.
9		Turn over to dump chips.
10	14	Semi-finish ream 10 holes.
	15	Semi-finish ream 10 holes, drill 8 7/16 in. deep.
11	16	Finish ream 10 holes.
	17	Finish ream 10 holes.
12	18	Drill 6½ in. deep; drill 4-in. deep.
	19	Tap seven holes.
13	20	Tap 18 holes.
	21	Tap 18 holes in left bank; tap one angular hole.
14		Unload to next machine.

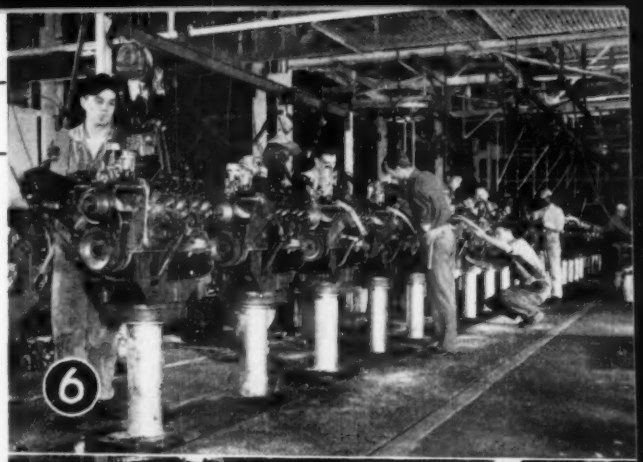




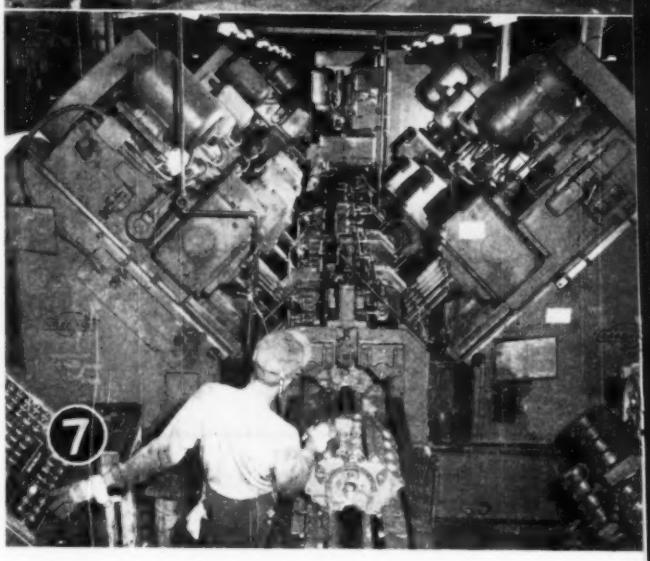
3 *Following final boring of camshaft and crankshaft bearing lines, the bores are checked by means of the P & W Air-O-Limit gages shown here.*

4 *First operation on V-8 engine cylinder heads is handled in two stages in Cincinnati tunnel type surface broaching machines.*

5 *First stage of assembly of Studebaker V-8 engines with blocks mounted vertically on the special stands.*



6 *The second or intermediate stage of V-8 engine assembly is found on this line. Here the engines are mounted in normal position and the assembly completed, including the addition of various accessories.*



7 *Looking down the middle of the extensive Greenlee transfer machine line for the V-8 cylinder block.*

are broached simultaneously. At the same time the broaching tools have short side sections which finish the sides and locating bosses on each side. Since the Studebaker block is of 90 deg V type, it will be appreciated that the broaching tools are installed at 45 deg to the horizontal axis on each side.

The block now passes through a succession of three Ingersoll transfer machines —nine-station, 10-station, and eight-station respectively—then enters two Greenlee transfer machines of 14- and 10-stations respectively. Leaving the last—eight-station Ingersoll transfer machine—the block is turned horizontally 90 deg with the top up and rear end leading.

It is of interest that the 14-station Greenlee to be described below has a total of 189 spindles for drilling, reaming, and tapping operations. Push rod clearance holes—1 1/32 in. diameter—require the use of special carbide drills having a HSS center section of smaller diameter for starting the drill, followed by the full diameter section tipped with cemented-carbide. It is also noteworthy that some of the holes drilled in this machine require unusually long depths, ranging 4¼ in., 5⅜ in., 5½ in., 7 in., 8 7/16 in., a few around 3 in., all being step drilled.

To illustrate the complexity of transfer equipment, the following is an outline of the operations performed on the 14-station Greenlee. (See table.)

Feeding into the second, 10-station Greenlee, the block is turned over and loaded bottom up into the first station. The second station drills five holes and semi-finish-reams the oil regulator hole. The third station drills six long angular holes. Station 4 drills five deep holes and finish-reams the oil regulator hole. Station 5 taps 34 holes in pan rail, bearing caps, etc. At Station 6 the case is indexed 90 deg to go through end-wise with bottom up, Station 7 being idle. Stations 8 and 9 tap 17 holes in front end; tap 10 holes in rear end. At Station 10 the block is turned 90 deg and moved to the washing machine for initial cleaning.

At this point the block is tested for water tightness, using a new piece of equipment for the purpose —a Whittington vacuum test machine. The conventional water test fixture is employed only to locate leaks when indicated by the vacuum test.

Following the assembly of main bearing caps the block is processed through a four station Ingersoll cam and crank-boring machine; then a three-station Ingersoll transfer machine for pressing-in cam bearings and finish boring.

Cylinders are bored in an Ingersoll eight-spindle boring machine having a unique cycle. It does the semi-finish bore on the down stroke, then finish-bores on the return stroke. Cylinder bores are finish-honed in an eight-spindle Barnesdrill No. 320 honing machine. Final cleaning of cylinder blocks is done in a new Centri-Spray washer.

Cam and crank bores are held to extremely close limits for size, roundness, and axial alignment. These

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Chevrolet's 1951 Cars and Trucks

Feature New Self-Energizing Brakes

Styline De Luxe four-door sedan.

ALTHOUGH no major design changes have been made in Chevrolet's passenger car line for 1951, many improvements have been made in both chassis and body. These range from the hydraulic brakes of a different type to design innovations that make the car appear longer and lower than any previous Chevrolet model.

The Powerglide automatic transmission has been refined for the latest models, although remaining fundamentally the same. It will again be optional on De Luxe models only.

Frontal appearance is changed by new bumper guards, emblem and hood ornament which carries a jet-craft form. The crown of the rear fenders has been raised to increase the flowing lines of the body. Rear fenders now mount the combination stop and tail light, with a newly styled trunk lid ornament and re-designed bumper guards. The radiator grille has been restyled and simplified. It now consists of three horizontal bars, the lower two extending further across the fenders to form a circular frame for parking lamps.

Exteriors of the De Luxe bodies have a greater amount of chrome and stainless steel trim and a moulding which starts just above the wheel opening in the front fenders is extended into the doors.

The principal mechanical change for 1951 is in the brakes. They are now two-shoe, self-energizing type with one hydraulic cylinder per wheel. Front drums are 11 by two in. and rear drums 11 by 1¾ in. Total brake lining area is 161 sq in. Bonded linings are used.

The torque tube has been made more rigid by an increase in outside diameter from 2 13/16 to 3¼ in. At the same time the thickness of the wall is reduced about 0.028 in., holding the weight to approximately

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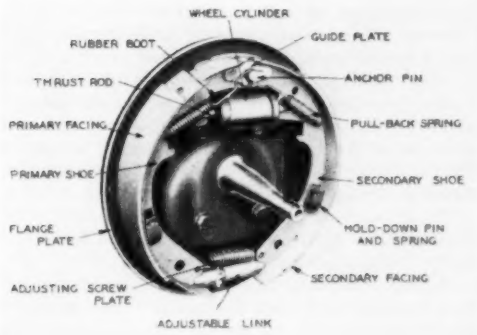
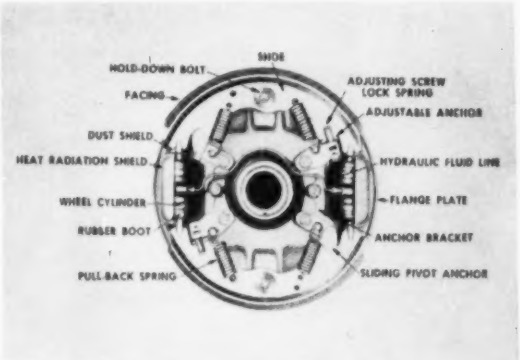
New two-shoe, self-energizing brake used on 1951 passenger cars.



"Twin-Action" balanced brakes used on rear wheels of heavy-duty trucks.

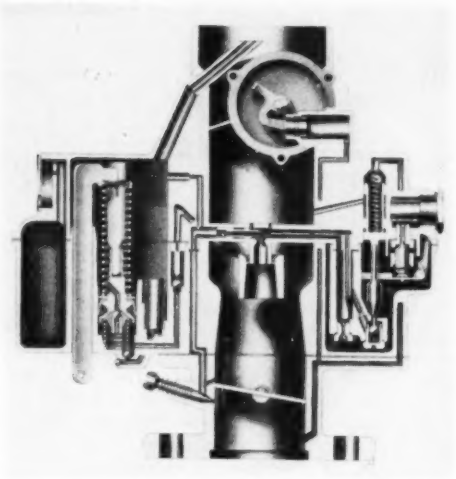


1951

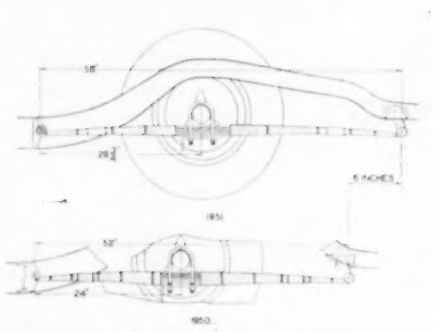
All 1951 models have restyled radiator grille and moldings.

VIEWING the Pontiac line for 1951 it is of interest that except for certain new mechanical features, to be noted later, the Silver Streak models are substantially unchanged insofar as sheet metal and major chassis details are concerned. From the standpoint of eye appeal much has been gained by the introduction of restyled radiator grille treatment, moldings, and exterior decoration, particularly on deluxe models. Interior trim design in all models also has been given further attractive treatment.

One of the most significant of the mechanical changes is an improvement in Hydra-Matic drive with the introduction of a cone clutch reverse assembly. It makes shifting into reverse more pleasant and faster by making unnecessary the momentary pause in "Lo" before making the shift into reverse. Equally important is the fact that this feature makes it possible to "rock" Hydra-Matic for the first time, providing a means of getting out of ruts, mud, sand or snow, heretofore available only with hydraulic torque converter drives. Also added is a noteworthy safety device—a reverse inhibitor—which prevents reverse shifts at car speeds above 10 mph.



Sectional view of the new RFD carburetor with concentric float bowl.



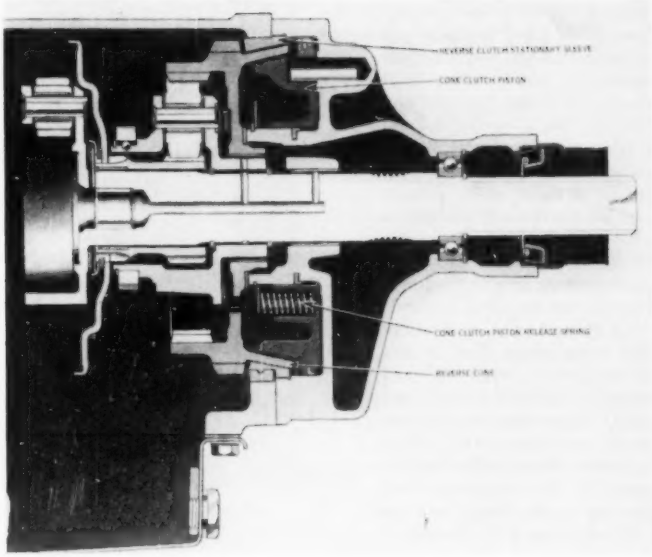
New rear suspension compared with suspension used in 1950.

In effect reverse has been changed from a manual shift to hydraulic control, in addition, the reverse anchor is no longer used for backing although it has been retained with revisions for car parking only. When the ignition is off and the shift lever moved to "R" the anchor, now spring-loaded, automatically engages teeth cut on the outer rim of the reverse planetary gear, providing a parking lock.

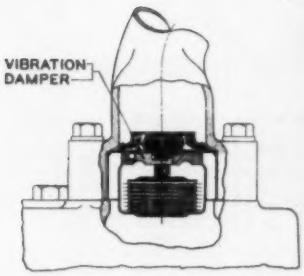
Essentially, the new reverse mechanism is made up of a cone clutch member formed as part of the reverse planetary outer gear. A large aluminum piston actuated by fluid pressure has an integral concentric conical ring which nests against the inner surfaces of the cone clutch and forces it against a conical aluminum sleeve secured to the transmission housing. When the outer gear is stopped, rotation of the drive shaft is reversed. When the shift lever is in "Lo" or "Dr" position, spring action forces the contacting surfaces to remain separated.

Although both the six- and eight-cylinder engines remain unchanged, save for several features to be mentioned here, bhp output for both engines will be

Pontiac



New reverse mechanism in Hydra-Matic transmission.



Part-sectional view of water outlet thermostat showing construction of vibration damper.

given a higher advertised rating. This increase is explained by the fact that Pontiac has always used the conservative GM correction for standard test conditions heretofore and has now adopted the SAE method used by other manufacturers. Using SAE procedure, the Eight now has a rating of 116 hp at 3600 rpm; the Six bhp at 3400 rpm.

On the Six, Pontiac has adopted a timing chain bumper, consisting of a synthetic rubber pad vulcanized to a steel bracket which is positioned on the left edge of the timing chain cover near the path of chain travel. It is fitted with a running clearance of about 1/16-in. with respect to the chain, and serves to prevent vibration or whip due to looseness or wear. It also permits the camshaft-driven distributor to fire at proper intervals even after considerable chain wear occurs.

On both Six and Eight is an improvement in the water outlet thermostat, consisting of the addition of a damping spring assembled to the thermostat housing cross bar so as to bear on the valve shaft.

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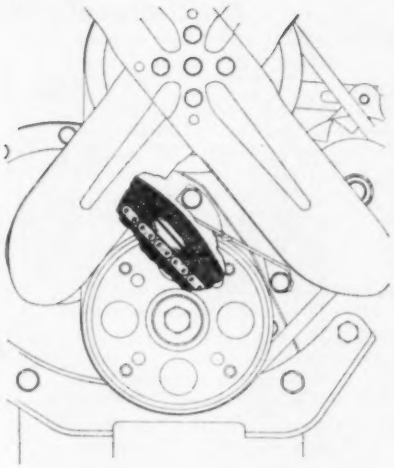

Cutaway illustrations showing timing chain bumper used on six-cyl engine.

New Hand Brake Requires Less Effort

CHRYSLER states that more than three times the maximum braking effect of the external-contracting hand brake is obtainable with the new internal-expanding hand brake now used on all Dodge, De Soto, and Chrysler cars equipped with hydraulically - operated automatic transmissions. This greater braking effect is made possible by the self-energizing action of both brake shoes, which together have about the same braking area as the brake band of the previous brake.

As shown in the illustration, both brake shoes float around an anchor pin when no hand force is applied through the cable. The brake shoe assembly is not connected to either the brake drum or the support plate, and it is prevented from rotating by the anchor pin. A

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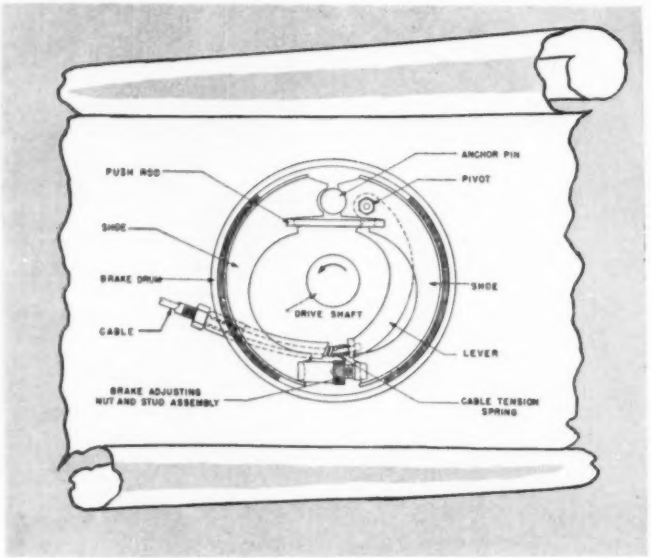
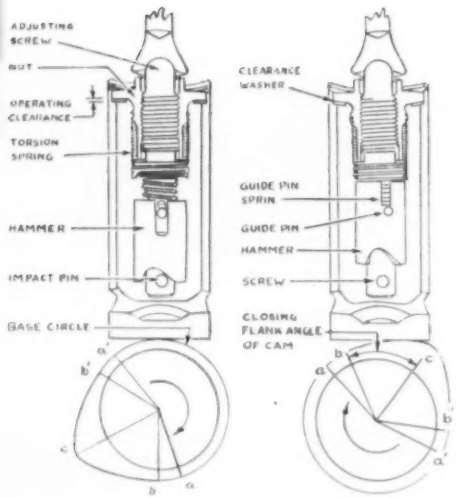


Internal-expanding brake operation. (Looking forward, resisting forward movement)

Mechanical, Self-Adjusting Valve Tappet



A MECHANICAL, self-adjusting valve tappet, the Mech-a-Matic, has just been developed by Thompson Products, Inc. The device is completely self contained and is interchangeable with present tappets.

Operation of the mechanism may be visualized by examination of the cutaway illustrations. When the valve is closed, operating parts of the tappet assume the position shown at the left. Undesirable clearance is taken up by the spring-rotated adjusting screw, but this take-up is limited by a spacing device in the form of a washer to exactly the desired clearance. Before opening of the valve actually starts, the clearance washer is pressed against the adjusting nut, reducing clearance at this point to zero, after which opening of

(*Turn to page* 122, *please*)

(left)—Position of tappet parts with valve closed. Operating clearance is established at the clearance washer.

(right)—Valve just starting to close. Hammer has floated to its upper position.

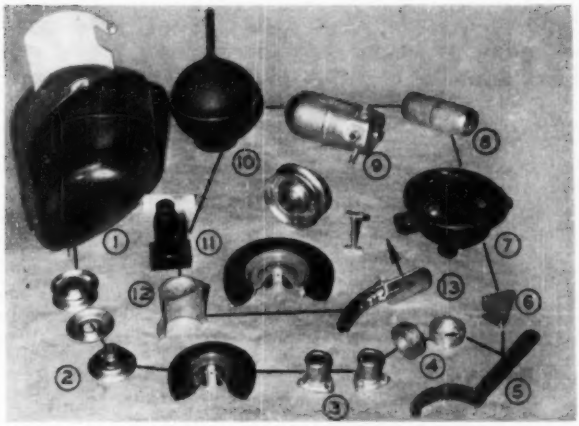


Fig. 1—A variety of products designed to utilize the electric-furnace brazing technique. Items are identified and described in text.

Fig. 2—View showing electric-furnace brazing equipment and conveyor system that feeds the furnaces. At the far right is a portion of the degreaser. In the extreme right background is an aluminum brazing furnace through which parts are carried by a rail conveyor.

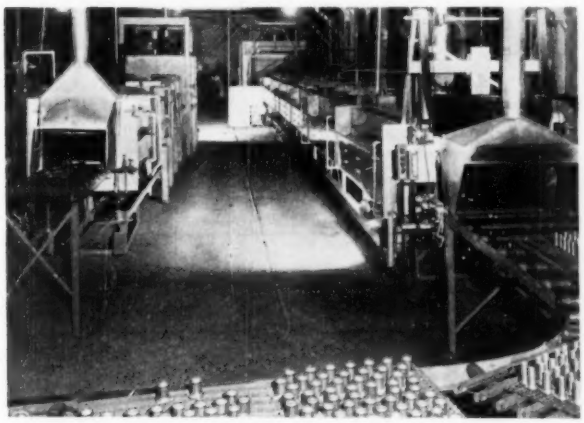


Fig. 3—Discharge end of the two furnaces described in the text.

Modern Approach to Product Design

By R. E. Jones
Superweld Corp.

ONE of the most important problems confronting every design engineer is that of keeping the cost of development and initial small lot manufacture to a minimum when working with a new item, and at the same time providing a satisfactory design which will lend itself to low cost in both materials and labor when the mass-production stage is reached. A thorough investigation of the various possible methods of metal joining should be made as the first step after the basic idea of design and appearance is established.

Along with this approach to product design, the factors worthy of consideration are: Cost and availability of materials; labor in fabrication, assembly and finishing; appearance and useful life of the proposed design; minimum and maximum production requirements.

The various methods of metal joining are recommended as the first step in production planning in order that the designer can take advantage of low-cost raw materials if possible, using standard hardware parts, tubing, screw machine products, and inexpensive metal stampings to fabricate the unit in production. In many cases, a search of a parts catalog will reveal several components for the finished unit already

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Problems of Engine

How Coolant Temperatures Affect Engine Performance

By V. G. RAVIOLO
Ford Motor Co.

IT has been suggested that engines would operate more efficiently if the overall engine coolant temperature was increased. At Ford Research we investigated a synthetic coolant with a specific heat of 0.4 and compared it to water. Operating temperatures, shown in Fig. 1, were determined on the road. Oil temperature increased 50 to 80 F, coolant temperature increased 40 to 50 F, and carburetor air temperature was decreased approximately 20 F by blocking off the manifold heat.

Several engines were then run on a dynamometer, alternating both coolants, at oil and coolant temperatures controlled to temperatures obtained in the test car, and performance was measured. Higher coolant temperature resulted in a decrease of both imep and horsepower as shown in Fig. 2. The net result was a considerable loss of both bhp and torque over the whole speed range.

Fuel flow and spark advance were adjusted to the optimum for each temperature and speed, but although the fuel flow was reduced with the high temperature coolant, there was a net loss of thermal efficiency. Although the difference is small, it is significant that there were no reversals.

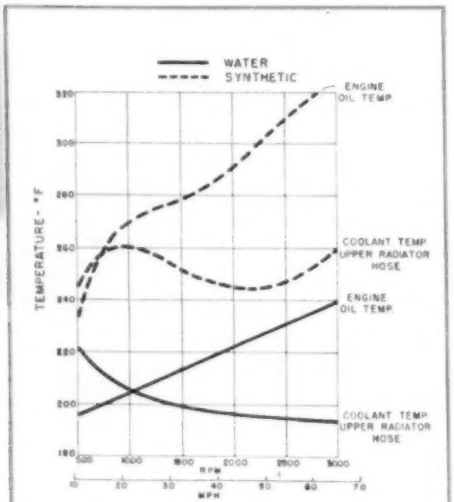


Fig. 1—Temperatures at various locations at maximum power and best spark setting. Water, synthetic coolant, and oil temperatures controlled to those obtained in test car. Engine—L-head, V-eight.

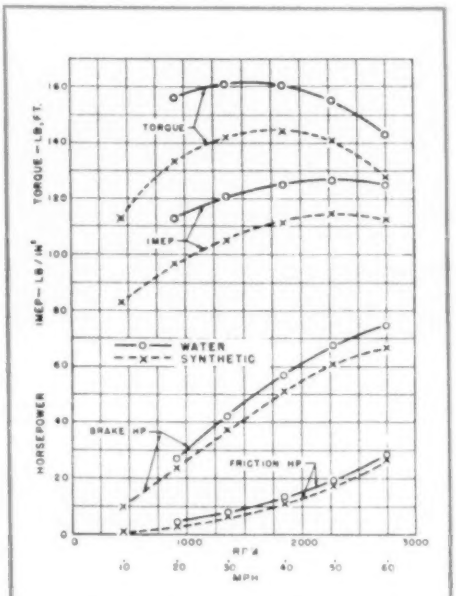


Fig. 2—Maximum performance with best spark setting. Temperatures of water, synthetic coolant, and oil controlled to temperatures obtained in test car. Engine—L-head, V-eight.

Another series of tests was run over a temperature range of 200 to 280 F with the oil temperature controlled at 200 F. There was a constant decrease in ihp and bhp as temperatures increased, and there was a corresponding decrease of brake themal efficiency.

Operation *at Recent SAE Meetings*

Appearing Herewith Are Abstracts of Some of the Papers Which Have Been Presented at Four Recent SAE Meetings—National Tractor Meeting, Milwaukee, Wisc.; National Aeronautic Meeting, Los Angeles, Calif.; National Transportation Meeting, New York, N. Y.; and Detroit Section Meeting.

Gas Turbine Powered Truck Has Power Braking

By W. M. BROWN
Kenworth Motor Truck Corp.

THE Navy Department, Bureau of Ships, having authorized the development of the Boeing gas turbine engine, was at the same time sponsoring the testing of a semi-automatic planetary transmission. Since a truck chassis for testing the transmission was being operated under the sponsorship of the Bureau of Ships, it was suggested that the two projects could be combined, the turbine engine being installed in the transmission test chassis, to the mutual advantage of both projects. Consent was given to this proposal and the turbine powered truck eventually was born.

Two separate units are combined to make up the Boeing Model 502, 175-hp, gas turbine engine. In the first unit, a power producing section, air is compressed by a centrifugal compressor and discharged past a fuel injection nozzle in each of the two cylindrical combustion chambers, where continuous combustion takes place, and the products of combustion are directed through a primary single-stage turbine which utilizes two-thirds of the energy of the gases in turning the compressor shaft. Remaining jet thrust is led to a secondary single-stage turbine, in the second unit or power output section, which produces shaft power. At full power the compressor shaft rotates at 36,000 rpm; the secondary turbine turns at 22,650 rpm, and drives through a 9.06 to one reduction gearing which results in an output shaft speed of 2500 rpm.

Since the only connection between the power producing and power output units is that of gas pressure, the compressor unit can operate independently from the secondary turbine unit. Therefore, in effect, the secondary turbine wheel becomes a torque converter in the engine with the ability to increase the torque progressively with decreasing speed until the greatest torque is developed at stall.

Power from the gas turbine engine is transmitted through a marine reverse gear, a seven speed and reverse planetary transmission, and a Spicer 8031 three-speed auiliary gear box to the rear axle carrier.

Obviously, the truck is an adaptation from available material to produce a test vehicle only. The gas turbine was not designed for truck installation at the outset and the present gear box units were chosen for availability.

The function of the marine reverse gear, one to one ratio in both forward and reverse, is two-fold. First, this gear box is used to produce conventional rotation since rotation of the turbine output shaft is

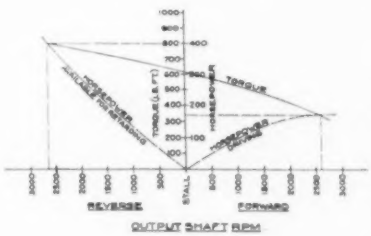
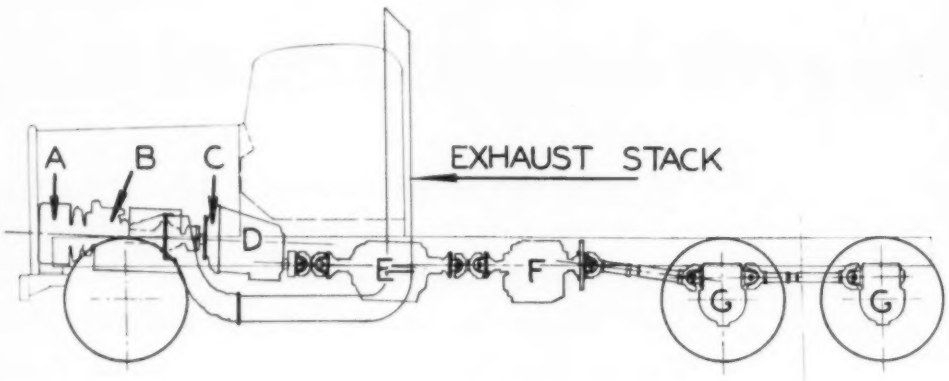


Fig. 3—Torque and horsepower curves shown in this graph are for three conditions of operation—downhill braking, starting from rest, and hill climbing at full power.



This illustration of the power train arrangement on the test truck shows the air-intake silencer (a) at the front of the gas turbine engine (B), which drives through a coupling (C) into a marine reverse gear (D) which in turn drives through a seven speed and reverse planetary transmission (E) and a three-speed auxiliary transmission (F) to the rear axles (G).

opposite that of a conventional truck type engine. The second function of the reverse gear is to enable the use of power retarding.

In respect to power retarding, Fig. 3 indicates the torque curve resulting in three conditions of operation—downhill braking, starting from rest, and hill climbing at full power. In addition to the torque curve, the graph also shows horsepower available for driving the truck. The retarding feature is believed to be unique and has every possibility of developing into a system which will greatly reduce the load on the service brake system of any vehicle so equipped. It is interesting to note that the horsepower available for retarding, which in this case is the capacity to absorb horsepower, roughly corresponds to a 4.5 per cent grade descent with 68,000 lb gross combined weight, the vehicle traveling at constant speed. The maximum horsepower available for hill climbing is 175 which will allow the vehicle to ascend a six per cent grade at 9.3 miles per hr with 68,000 lb gross weight.

Operating data are rather meager and the total operating time has not been sufficient for complete evaluation. Engine life and fuel consumption in sustained highway operation are two questions which can be answered by accumulated miles of highway operation. There are, however, some data on engine performance in respect to specific fuel consumption and output torque that can be presented.

Fig. 4 shows comparative fuel consumption curves for three conventional automotive engines and the Boeing gas turbine. At full rated power the turbine engine fuel consumption is nearly twice that of the gasoline engine and almost three times that of the

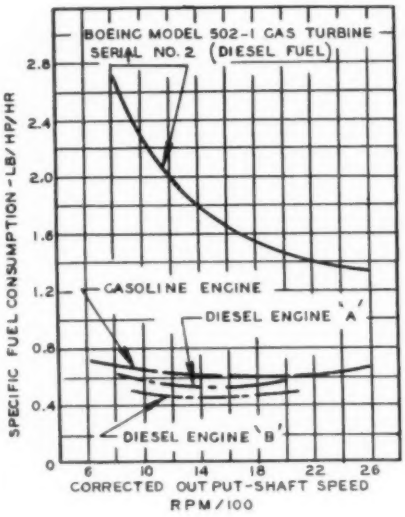


Fig. 4—Specific fuel consumption curves of the Boeing gas turbine, two Diesel engines, and one gasoline engine are plotted on this graph. It may be noted that the gas turbine fuel consumption at full rated power is twice that of the gasoline engine and about three times that of Diesel engine "B". The piston engines used for this comparison are current truck engines.

lowest Diesel engine. This in itself appears to put the gas turbine engine at quite a disadvantage, but Boeing engineers point out that in two years of testing and developing the engine they have bettered its fuel economy by approximately 16 per cent. Future plans indicate that some additional improvement can be expected through further refinements, such as: regeneration or preheating of the combustion air, multi-stage compression, and the possibility of higher combustion temperatures.

Another set of performance data is given in Fig 5 which illustrates graphically the output torque curves of three different piston engines compared to the turbine engine torque curve. Note the characteristic shape of the piston engine curve and the non-usable portion of those curves. The gas turbine curve does not peak and then fall to zero at zero engine rpm, but continues upward to a maximum at stall. The fifth curve is that of a d-c motor, similar to those used in trolley bus operation, and is only reproduced here to give a comparsion of three distinct types of power.

Recognizing that the small gas turbine is a relatively new form of driving power with many applications already established and many more yet to be proved, it can be pointed out that there is a place for the turbine engine in highway freight hauling operations—subject to certain limitations, it has not reached its maximum in performance and development, it is not yet available for commercial installation, and the cost probably will not be prohibitive when it is available commercially.

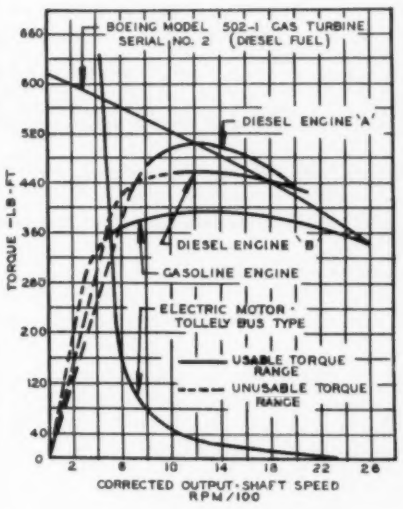


Fig. 5—Three reciprocating engines, one gasoline and two Diesel, and a DC trolley bus motor are compared to the Boeing 502 gas turbine in respect to output torque. The gas turbine torque curve continues upward to a maximum at stall, while the piston engine curves fall to zero at zero rpm. Characteristics of the electric motor are shown here only for the purpose of comparing three types of power.

Comparison of Turbine-Propeller Engines With Various Cycle Arrangements

By TIBOR F. NAGEY
Aeronautical Research Scientist
NACA Lewis Flight Propulsion Laboratory.

Net thrust horsepower specific fuel consumption for basic, reheat, regenerative, and regenerative-plus-reheat turbo-prop engines is shown in Fig. 6, where specific fuel consumption is plotted against compressor pressure ratio for a turbine-inlet temperature of 2000 R. Curves are shown for flight speeds of 200, 400 and 600 mph at sea level in Fig. 6a and at an altitude of 30,000 ft in Fig. 6b. (P. 114.)

Curves for the reheat engine show the same trends as those for the basic engine. Specific fuel consumption of the reheat and the basic engines are about the same at a compressor pressure ratio of six, and the fuel consumption of the reheat engine is somewhat lower than the basic engine for a pressure ratio of 20 at both sea-level and 30,000-ft altitudes.

At both altitudes, the compressor pressure ratio required by the regenerative engine for minimum specific fuel consumption is lower than that required by the basic and reheat engines. Minimum specific fuel consumption for the regenerative engine occurs at compressor pressure ratios of six at sea level and nine at an altitude of 30,000 ft. The maximum decrease in minimum specific fuel consumption of the regenerative engine from that of the basic is four per cent at sea level, and less than two per cent at an altitude of 30,000 ft. When the specific fuel consumption of the two engines are compared at a pressure ratio of eight, the improvement of the regenerative engine over the basic engine is approximately 10 and 15 per cent at altitudes of sea level and 30,000 ft, respectively, for all flight speeds investigated.

(*Turn to page* 114, *please*)

Ford 1951

Truck Improvements

Ford's 1951 line of trucks, which includes more than 180 models, features new front end styling, improved cabs and numerous engine refinements.

ALL four engines now have chrome top piston rings, autothermic expansion control pistons and new high-lift camshafts. Exhaust valve stems on all engines are nitrided and valves and valve spring retainers are semi-rotating. Distributors are of the full vacuum control type. Offset piston pins are used on 95 hp six-cyl and 100 hp V8 engines for quiet operation. The F-7 and F-8 trucks have a larger radiator tank.

A steering column gearshift on F-1 light duty models provides more cab and floor space. Rear axle ratio of the F-1 truck has been changed from 3.73-to-1 to 3.92-to-1.

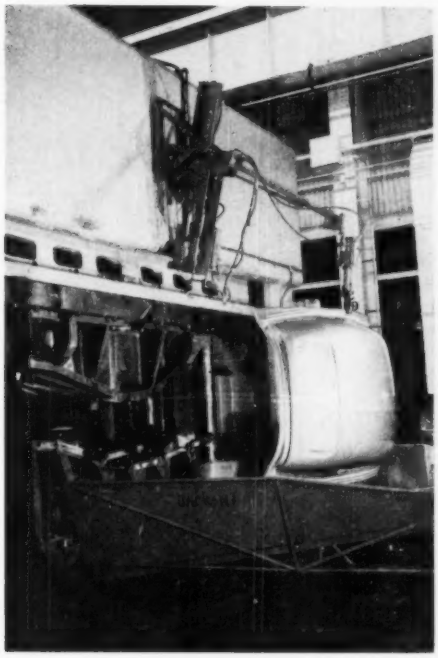
Distribution of braking force on F-4, F-5 and F-6 trucks is modified to obtain better balanced braking and longer lining life. The clutch disk on F-7 and F-8 heavy trucks has been made more rugged. F-1, F-2 and F-3 trucks have new front bumpers.

Cast spoke wheels with demountable rims to provide interchangeability with trailer wheels now are standard on F-7 and F-8 models, but steel disk wheels still are available.

The cab and front end for 1951 have a more rugged and smarter appearance. The rear window has been enlarged to more than three and one-half ft. A new instrument panel incorporates new full-vision instruments, rheostat type instrument light switch and a hand throttle on all conventional models. Weather sealing on doors is improved, and the floor pan area also is sealed against weather and fumes. Dual windshield

(Turn to page 100, please)

The 1951 F-5 Ford stake truck with new "5-Star Extra" cab.



One of the iron hands used at the new Fisher Body plant is shown holding an all-steel roof which is about to be placed on a conveyor that will carry it to the next press.

Television

Increases Efficiency At New Fisher Body Plant

With 169 Presses and 85 Welding Machines, in Addition To Other Modern Equipment, This Factory Will Supply 21 General Motors Automobile Assembly Plants.

SEVENTH of the Fisher Body Division's metal fabricating plants, the new Pittsburgh factory will serve as a source of supply for 21 General Motor's domestic automobile assembly plants, particularly those on the eastern seaboard. It is located on a 68-acre site and consists of one large building having a manufacturings are of 651,800 sq ft.

The plant is laid out in a functional manner with the sheet steel and other raw materials arriving at the west end of the building, moving eastward via overhead cranes to blanking and shearing machines, on through the various lines of presses and sub-assembly operations, finally arriving at the east end of the plant.

Two major departments in the organization are devoted to manufacture. One is used for the production of large stamping dies and tools, and the other for fabricating a complete line of panels, roofs and other metal components used for automobile body-building.

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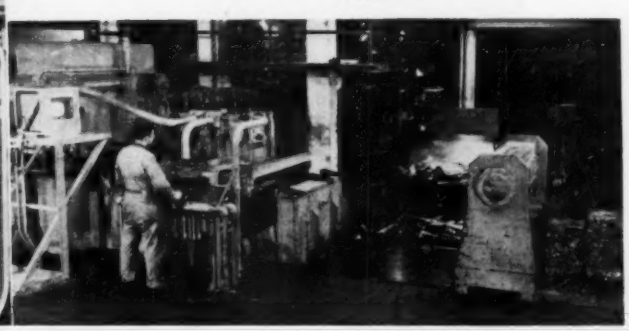


The operator stands at a control panel which governs conveyors bringing scrap to baling area, basket which dumps scrap into baler, compressor which squeezes scrap into 800-lb blocks and conveyors which carry baled scrap to waiting gondolas on track outside the building. Arrow points at television screen over his left shoulder. Inset shows enlarged picture of the view seen on the television screen.

Welding Without Heat or Electricity

KOLDWELD process, a method of cold pressure welding without the use of heat or electricity, was recently made available in this country. Developed by the General Electric Co., Ltd., in England (not associated with the General Electric Co. of the U. S.), this process of cold pressure welding is said to be applicable to all non-ferrous metals, particularly aluminum and its alloys. The required welding pressure can be applied manually or by power, and only the simplest tools are necessary.

As a result of investigations resulting from numerous inquiries, several new applications of the process were developed and some of these new applications are illustrated and described here.

Trap Weld

In order to weld screw studs to metal panels, for the attachment of knobs and handles, the trap weld was developed. The fabricated metal form consists of a metal insert firmly embedded into another metal structure by cold pressure welding.

Similarly, different types of metal inserts or parts can be molded between dissimilar non-ferrous metals. For example, a thin steel insert, such as a sheet or wire netting, can be molded within aluminum sheets.

A standard ferrous 10-32 thread screw stud trap welded to 3/32-in. aluminum sheet was tested with tensions up to 1500 lb, when the steel stud broke outside of the weld, Fig. 1. Although the welded joint showed distortion, it did not break, and the joint remained air-tight and moisture-proof. It is interesting to note that the welded joint was not distorted until tensions of 1000 lb were reached.

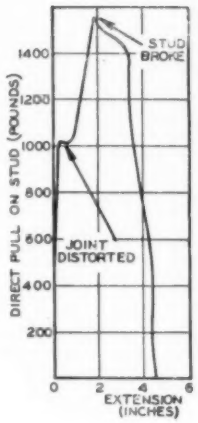


Fig. 1—Under a tension of over 1500 lb the standard 10-32 thread steel screw stud of the trap weld broke outside of the weld. At approximately 1000 lb pressure the joint showed some distortion, but at 1500 lb it was still air-tight and moisture-proof. The stud was fixed to 3/32-in. aluminum sheet.

Wave Weld

In many applications involving welding of flat stock, the standard straight-line weld was sometimes found undesirable because of

(*Turn to page* 100, *please*)

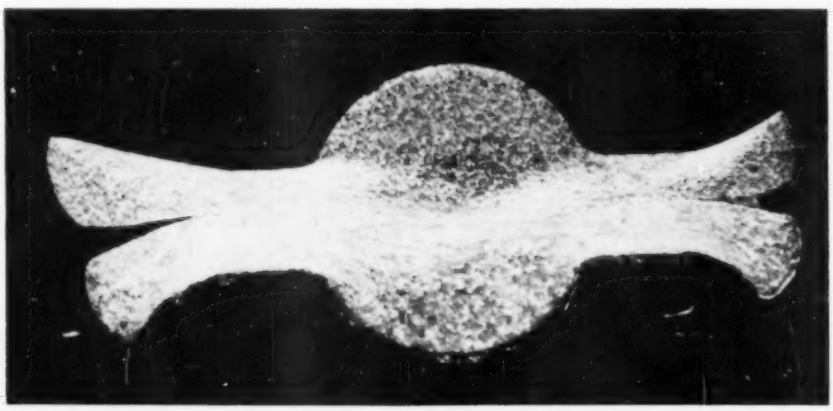
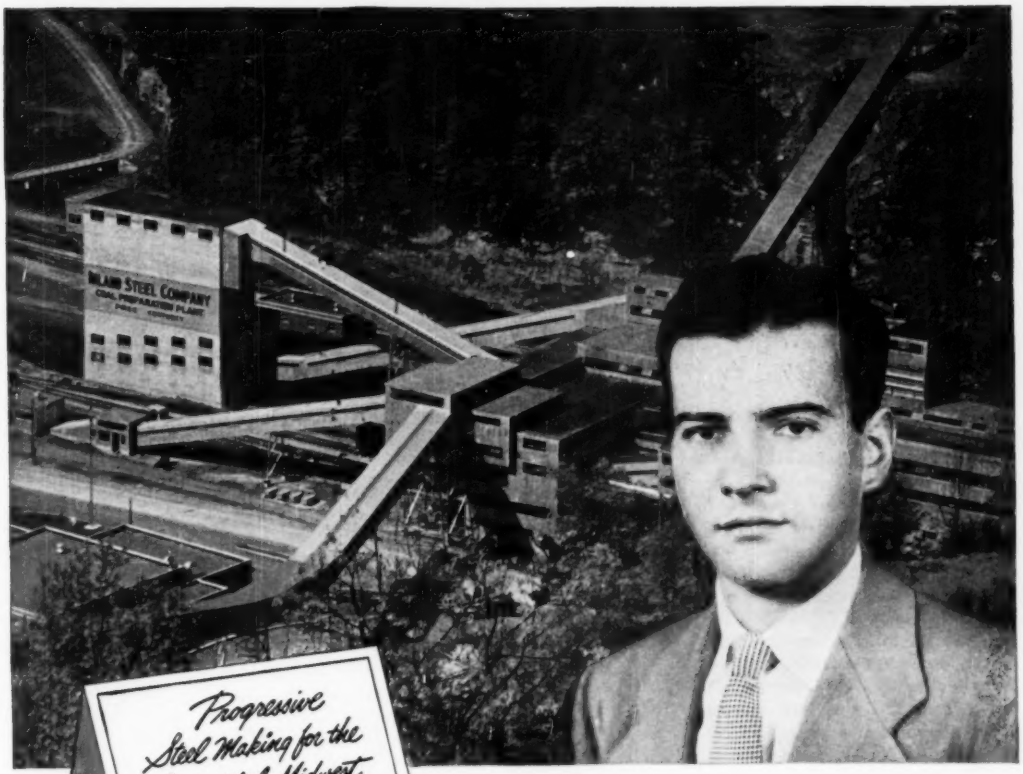


Fig. 2—This photomicrograph of aluminum and copper wire cold welded together shows how their facing halves fuse and flow out into welded flaps at each side.



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Induction Hardening Cuts Costs at Studebaker

WITH the growing acceptance of the technique of induction hardening, it is of interest that the Studebaker Corp. has developed a variety of applications of electronic induction hardening equipment. This phase of activity, under the sponsorship of the chief metallurgist, has resulted in some noteworthy production applications to be described here.

One of these, as illustrated, is the selective hardening of the tip of the rocker arm in a 25kw Reeve Electronics Model L7H-2 unit. Outstanding feature is the power driven dial feed table which holds the work and presents it to the special coil mounted in the rear. As the work comes out of the coil, it drops into the chute at the right and enters the oil quench bath. The parts then are carried out of the quench on a small flight conveyor. Rocker arms are made of pearlitic malleable.

Hardening of the flywheel ring gear is an impressive operation. Made of C-1043 steel, ring gears formerly were hardened and drawn. In current production they are hardened at the rate of 200 per hour in a two-station fixture in a 50kw Reeve Electronics Model L5J machine. By development of a unique type of coil, Studebaker is getting a hardening pattern of unusual geometric perfection, hardening through the entire tooth section as well as an area paralleling the configuration of the root and

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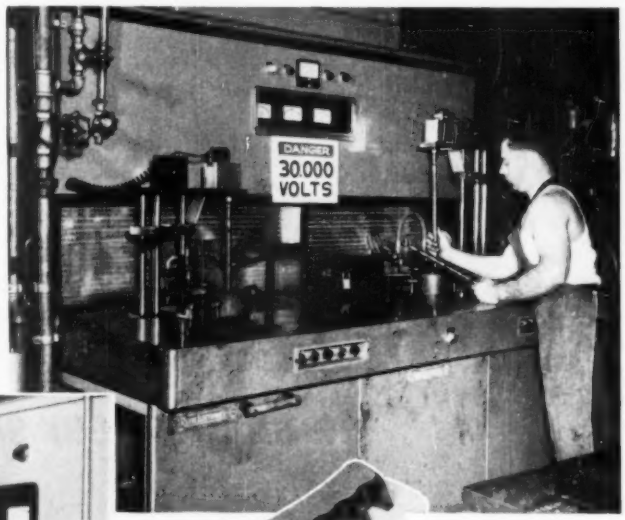
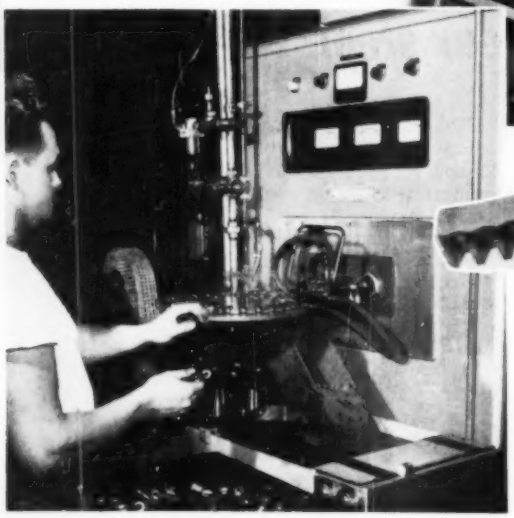
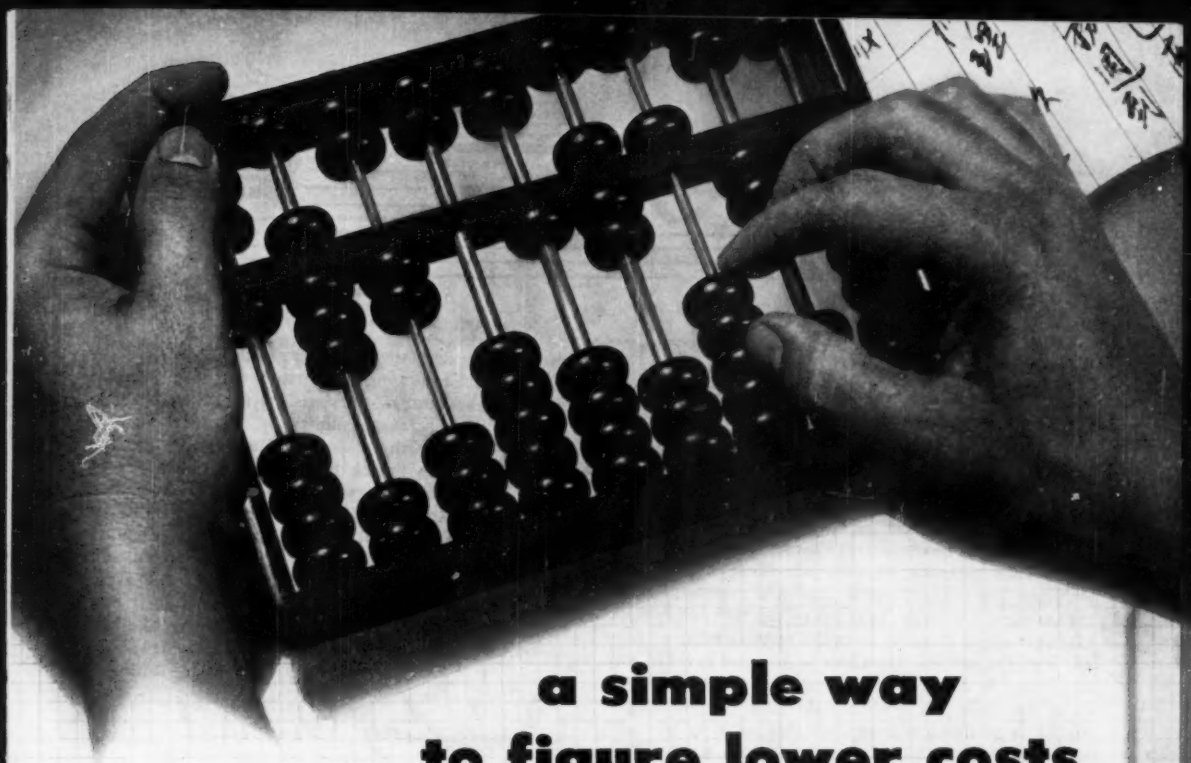




(Inset) This is an etched segment cut out of a Studebaker flywheel ring gear which has been induction-hardened. Note particularly the perfection of the geometric pattern of hardening.

(Upper Right) Here is a view of the 50kw Reeve Electronics L4J Model machine—of two-station type—used for hardening journal areas on V-3 rocker arm shafts. The operator at the right is seen in the act of removing a shaft from the fixture

(Left) Closeup of the 25kw Reeve Electronics Model L7H-2 unit for hardening rocker arm tips. Work is loaded into the dial feed as shown and is hardened while moving through a segmental coil in the rear.



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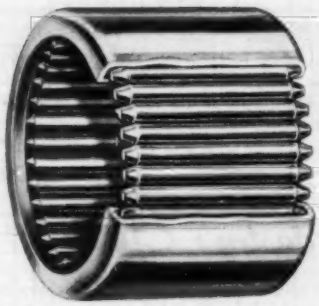

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AIRBRIEFS

By ROBERT McLARREN

Industry's Task

Apparently there is no one anywhere with the foggiest notion of the size of the aircraft industry's responsibilities in the immediate future. Certainly no one in the industry has any idea how big the job is with which it is now faced. It was our impression that Air Force headquarters spent about 90 per cent of its time planning its own size through the huge planning and budget staffs that are maintained by the taxpayer's money. In the very clearcut emergency that now exists it would seem the responsibility of the Air Force to *tell* the American people just how big an Air Force is required to defend this country. Anything less than this is simply shirking responsibility. Air Force planning officers duck this issue by tossing the hot potato right back at the Congress, at the Department of Defense, at the National Security Resources Board and at the White House. The USAF generals say that the size of the Air Force depends on all these groups and that it must be determined by "a wide variety of factors." We think the only factor involved in the question is Russia. In peacetime such political bickering, "coordination," "planning studies," "overall economic considerations," etc., may be essential or at least popular tactical maneuvering. But this is not peacetime and everybody knows it. Congress has never in its history refused to appropriate all the money asked of it in a period of unmistakable emergency, or war, call it what you will.

Industry's Efforts

The aircraft manufacturing industry has tried desperately for five years to obtain an inkling of the Air Force's future requirements. Failing this, it has suffered substantial losses during years when it held excessive staffs together as preparedness against large orders, has suffered badly clogged operations and thoroughly jammed production capacities when the deluge of orders arrived via a terse telegram from Washington. The industry is only now getting itself straightened out on the basis of the Korean war orders and has finally gotten its scheduling on an even keel after months of desperately hard work by its key people.

Now the Air Force hints that its 69-Group program, currently being used as a procurement framework, is really only the beginning and we "may" need a hundred groups or more in the very near future. In our opinion this comic opera approach to the problem is not only shamefully expensive but an absolute shirking of clear-cut responsibility on the part of Air Force officers. General Marshall once said that the American people "must be driven and driven very hard" before they will accept the strategic bombardment of the enemy's cities as a necessary military operation. We think that apparently General Marshall and his Air Force staff "must be driven and driven very hard" before they will accept the same thing, determine the material necessary to do it and state clearly just what the aircraft industry and the American people must do to keep this nation free.

Overhauling Overhaul

Last July 1 American, United and TWA airlines began a nine-month trial period of a new overhaul procedure that may reduce maintenance costs as much as 50 per cent. For many years the airlines have been required by the Civil Aeronautic Administration to overhaul their engines, propellers, airframes and equipment at stated intervals—whether these items needed it or not. For example, the Pratt & Whitney R-1830 Twin Wasp engine must be removed from the Douglas DC-3 every 1500 hours of operation and overhauled. The question is: is this too long or not long enough? The airlines sought and obtained permission from the CAA to see. Actually, each of the three airlines proposed a slightly different system but all are alike in essence and are based on the percentage of parts found below standard at various inspection periods. For example, if at 1500 hours less than 5 per cent of the Twin Wasp engines in a fleet of DC-3's is found in need of overhaul, the remaining engines are run another 100 hours. This process is repeated until more than 5 per cent of the engines show up needing overhaul.

In a recent meeting of airline representatives with the CAA in Washington, the program to date was reviewed and the CAA agreed that the new method was resulting in a more common sense approach to the problem. Next April 1 all of the results will be studied and a single formula adopted for all to replace the three slightly different ones now being used. The final result will be simply that aircraft equipment will be overhauled when it needs it and not at some arbitrary time that forces expensive overhaul on an item when it is unnecessary.

(*Turn to page* 124, *please*)

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Publications AVAILABLE

New Industrial Literature listed in this department is obtainable by subscribers through the Editorial Department of AUTOMOTIVE INDUSTRIES. In making requests please be sure to give the NUMBER of the item concerning the publication desired, your name and address, company connection and title.

L-130 Sprockets and Chains

Cullman Wheel Co.—Catalog 50 discusses the installation and selection of roller chain drives as well as giving detailed information on the company's sprockets and chains, pricing procedure, alterations, standard keyseats and setscrews.

L-131 Die Castings

Doehler-Jarvis Corp.—A new booklet entitled "The Role of Die Castings in Automatic Transmissions" has just been published. It describes, in brief, intricate control mechanisms, used in present automatic transmissions, that have been manufactured by die casting.

L-132 Nylon Plastic

E. I. du Pont de Nemours & Co., Inc.—The uses of nylon plastic for mechanical parts, particularly automotive applications, are given in Volume 12 of the firm's Plastics Bulletin. Information is also included on how to prepare samples for testing nylon.

L-133 Pressure Sealing Zipper

B. F. Goodrich Co.—Featured by a detailed description of installation procedures, a new eight-page publication discusses the firm's Pressure Sealing Zipper. In the brochure are detailed drawings showing the six styles in which the Pressure Sealing Zippers are made and a discussion of the proper method of selecting the correct style number which should be used in particular applications.

L-134 Compacting Presses

The Baldwin Locomotive Works—Baldwin-Defiance compacting presses of 75-ton and 200-ton capacity for the plastic, ceramics and powder metal industries are covered in a new four-page bulletin, No. 323, recently issued. The bulletin gives features, specifications and illustrations of the two presses, which produce tablets up to nine and 21 sq in., respectively.

L-135 X-Ray Thickness Gage

Westinghouse Electric Corp.—A new eight-page booklet, DB401-100, describing the x-ray thickness gage, is now available. It presents the basic theory of the gage, block-diagramming its electrical circuits to explain its operation. The operator's control, the gaging unit, and the indicator unit are described fully. Complete electrical and mechanical specifications also are given.

L-136 Welding Electrodes

Harnischfeger Corp. — Now being distributed is a new 56-page, Bulletin No. R7-8, electrode guide covering all P&H welding electrodes. The booklet includes a description of each electrode, typical applications and the sizes which are available.

L-137 Instruments

Wheelco Instruments Co.—In a new condensed catalog just released, a selection of indicators, controllers and combustion safeguards are illustrated and briefly described. An accompanying price list contains the listing, description and current price.

(*Turn to page* 124, *please*)

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THIS TIME SAVER COUPON is for your convenience in obtaining, WITHOUT OBLIGATION, more information on any one or more of the publications described above OR New Production and Plant Equipment OR New Products items described on other pages.

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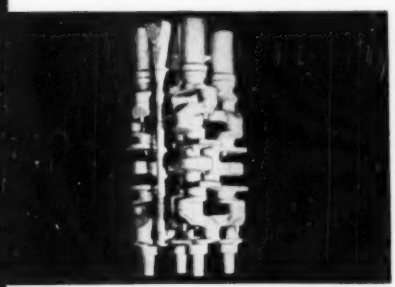
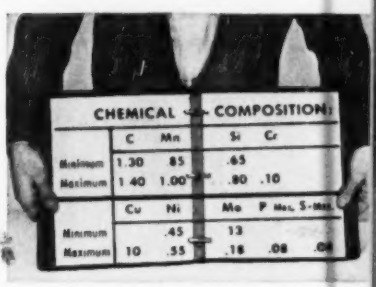
Progress Report No. 2 on the Application of Mass-Produced Cast Alloy Steel Crankshafts to the solution of some of today's Engine Production Problems.





CHEMICAL COMPOSITION

	C	Mn	Si	Cr
Minimum	1.30	85	.65	
Maximum	1.40	1.00	.80	.10

	Cu	Ni	Mo	P Max.	S Max.
Minimum		.45	13		
Maximum	10	.55	.18	.08	.04

By a special molding process, stacks of slab cores are arranged to cast 4 crankshafts at one time. Equally unique are—the special chemistry of AUSCO 80, the electric - furnace - melting, the foundry techniques, and heat straightening—resulting in Cast Alloy Steel Crankshafts of highest quality, that actually cost less!

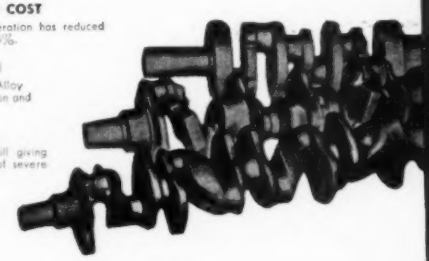
To give positive proof of freedom from injurious defects, Ausco Cast Alloy Steel Crankshafts are X-Ray Photographed under a million-volt camera. This is only one of a long series of inspections and tests that these crankshafts must undergo to insure the superior strength and wear resistance which they are so ably demonstrating in daily service all over this country in mass-produced motor cars.

A 100-page book of evidence of the advantages of Cast Alloy Steel Crankshafts for mass-produced motor cars is available to engineers and executives on request.

AUTO SPECIALTIES MFG. CO.
St. Joseph, Mich. Other plants at Benton Harbor, Hartford and Windsor, Ont., Canada.

Some of the Proven Advantages of Cast Alloy Steel Crankshafts Evidenced by Over Two Million in Operation:

- **REDUCED MACHINING COST**
  Elimination of the cheeking operation has reduced the rough machining at least 75%.
- **LARGER SCOPE MECHANICAL DESIGN**
  Engineers are practically unlimited, in designing Cast Alloy Steel Crankshafts to meet new engine high compression and high speed requirements.
- **LONG LIFE**
  Evidenced by examples of Crankshafts still giving complete satisfaction after 100,000 miles of severe service.
- **MINIMUM BEARING WEAR**
  Graphitic type of metal provides low friction in the presence of normal lubrication.



CAST
alloy steel
CRANKSHAFTS
AUSCO

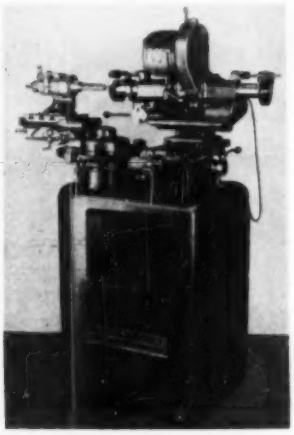
B5286 R Copyright 1950 by Auto Specialties Mfg. Co.

• PRODUCTION • NEW EQUIPMENT • PLANT •

FOR ADDITIONAL INFORMATION regarding any of these items, please use coupon on PAGE 54

M-73—Cutter and Radius Grinder

For grinding milling cutters, end mills and other tools, a cutter and radius grinder put out by Pratt & Whitney, Div. Niles-Bement-Pond Co., West Hartford, Conn., has wide application in tool, die and machine shops, Kellering shops, metalworking and plastics plants, etc.



Pratt & Whitney cutter and radius grinder.

Stock and special tools ground from the blank or sharpened on this machine include die sinking cutters, end mills, thread milling cutters, staggered tooth mills, Keiler cutters and tracers, lathe, planer and shaper form tools, special indicator points; profiling cutters, reamers, inserted tooth milling cutters, slitting saws, radius and angle milling cutters, and many special form tools.

Simplicity of design is said to make this machine quick to set up and easy to use. Longitudinal slides and cross slides on both the work holding unit and the main spindle assembly, plus a vertical slide on the latter, make for exceptional maneuverability. All movements are governed by positive stops and locks.

Provisions are made not only for conventional straight and spiral teeth, but for the various combinations of radii, angles and spirals encountered in die and mold making cutters. The work holding unit is mounted on an a curately graduated swivel base which enables the operator to blend ball-nose and radius-nose grinds into perfect tangency with the side teeth of an end mill without difficulty, and to produce draft angles on straight or spiral flutes.

The P&W cutter and radius grinder is available in two types, the R-6, having a flute length capacity of 4½ in., and the R-8, which will accept flutes up to 10 in. long. The R-8 will accommodate Brown & Sharpe taper shanks up to No. 12. The R-6 will take up to No. 9 B&S as regularly equipped, and with additional equipment will also accept up to No. 12.

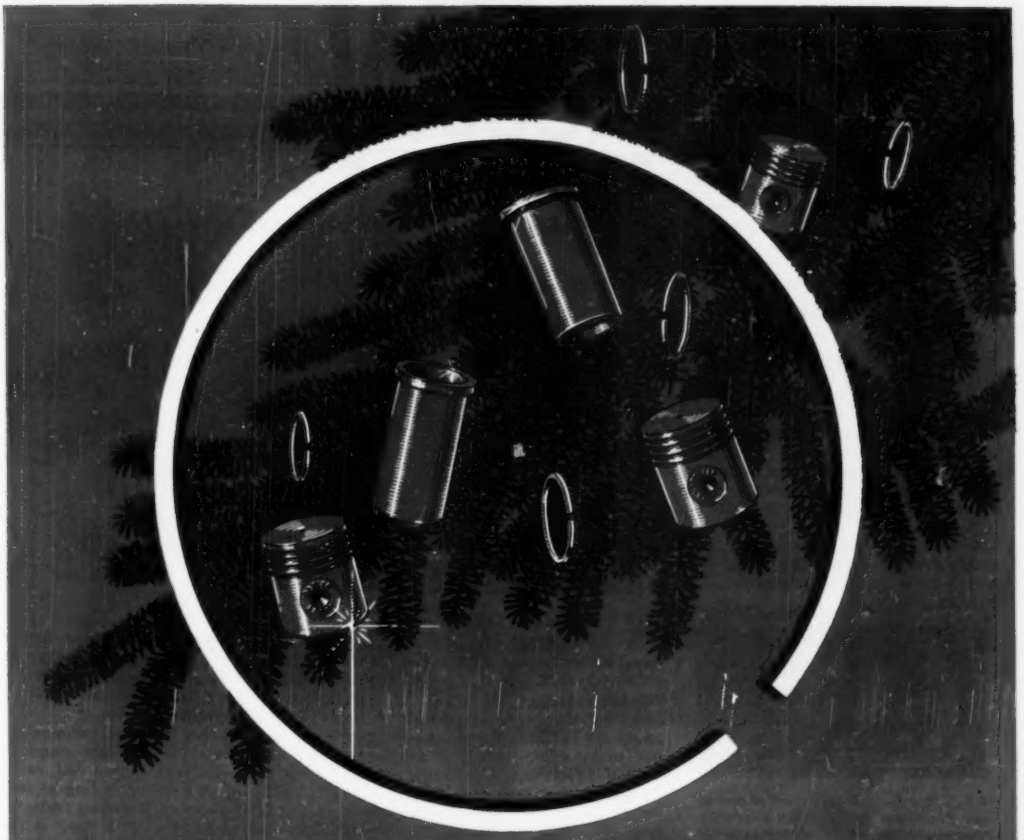
M-74—Three-Phase Resistance Spot Welder

A resistance welder for spot welding aluminum, magnesium, stainless steel, Inconel, Monel, brass, mild steel and other alloys, developed by Sciaky Bros., Chicago, Ill., can be quickly and easily adjusted to welding any of the above-mentioned metals as well as various thicknesses of each. Previously, the company states, resistance spot welders have been much more limited in range of material and thickness which any one machine could handle.

This new Sciaky PMCO2ST "three-phase" Modu-Wave welder, designed for welding to AN specifications, will weld even heavier thicknesses of aluminum, making it applicable to welding various aircraft components including primary structural members. No costly changes in the machine are necessary to change from one thickness or one material to another. It can be amortized more quickly and is adaptable to changes in product design or in production techniques. Welding speeds are said to be greater with this new welder, and because it is three-phase it can be used where there are power limitations. The Sciaky three-phase system is said to use up to 75 per cent less current than used by a single-phase welder, and to operate at approximately 85 per cent power factor as compared to the 30 per cent factor of single-phase machines.

(*Turn to page 62, please*)

Sciaky three - phase Modu-Wave resistance spot welder, Model PMCO2ST.



To you* from us

As we near the end of the 40th year of Sealed Power, it seems in order to express our thanks again—for your years of co-operation and confidence, which have kept Sealed Power at the head of the field. Today's Sealed Power staff and facilities are the finest in our history. Use them to help make your good engines even better!

SEALED POWER CORPORATION
MUSKEGON, MICHIGAN

Sealed Power

PISTON RINGS · PISTONS
CYLINDER SLEEVES

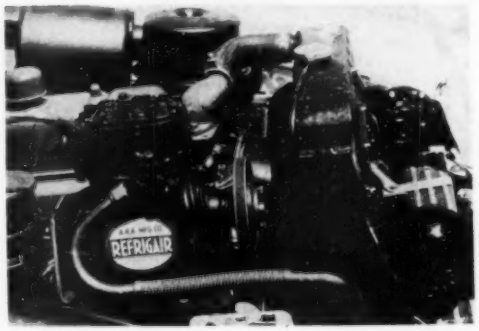
*Automotive engineers and production executives

NEW PRODUCTS

FOR ADDITIONAL INFORMATION regarding any of these items, please use coupon on PAGE 54

P-121—Automobile Air-Conditioning Units

The A. R. A. Mfg. Co. of Ft. Worth, Texas, offers automobile refrigerated air-conditioning units known as REFRIGAIR by which automobile inside temperature can be reduced 20 to 25 deg and dust conditions considerably lessened, providing cool filtered-air comfort at all speeds. These units consist of a compressor mounted on the motor, condenser installed between the grill and radiator, and evaporator case with two circulating fans compactly mounted in the rear of the trunk. Air inlet louvres on the package tray directly behind the rear seat circulate the cool air. Freon No. 12 is used for the refrigerant. Each car is insulated with foil and fibre glass. Standard equipment includes finger tip, three speed switches on the dash board for positive control of cool air circulation.



A.R.A. Mfg. Co.'s Refrigair units at front of car. Compressor is mounted on the motor. Condenser is installed between grille and radiator.

A.R.A. Mfg. Co.'s Refrigair unit at rear of car. Evaporator case with two circulating fans mounted in rear of luggage compartment.

REFRIGAIR develops up to two tons refrigeration capacity necessary because of the great amount of glass, and the intense heat from the sun, the engine and the road, to which an automobile is subject.

Maximum cooling is attained by sealing off the hot trunk area from the car interior, and insulating the car throughout. Two fans, at high speed, re-circulate the air in the car interior two to three times a minute. The two cold air inlets fit flush with the package tray and do not interfere with rear vision, while their adjustable louvres allow full adjustment of air flow to suit the occupants of the car—no blowing directly on the back of neck or head. Each fan has a separate fuse to assure continuous air circulation and a separate 3-position switch to allow a wide range of air volume in excess of 400 cfm. The evaporator case is heavily insulated with Armstrong Cork to eliminate sweating or condensation in the trunk. REFRIGAIR'S three major parts, plus necessary copper tubing and fittings, comprise the condenser, installed between the radiator and grille—designed not to interfere with the automotive cooling system; the compressor, installed at the front of the engine, coordinated to engine speed and driven directly off the crankshaft by a pulley mounted on the balancer; and the evaporator case, installed against the rear of the back seat and under the package tray. Total weight is 142 lbs, evenly distributed front and rear. It is a completely sealed system. "Sweat Joints" are used throughout.

P-122—Combination Magnetic Starter

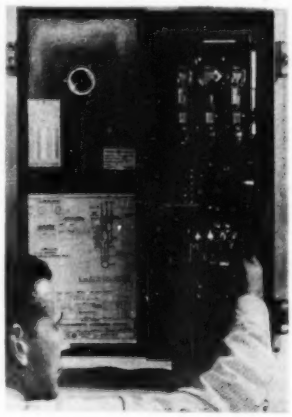
A combination starter conforming to the automotive manufacturers' Joint Industry Conference electrical standards for industrial equipment is available from General Electric's Control Divisions, Schenectady, N. Y., in both fusible and non-fusible types.

A drip channel across the top and around the sides of the new starter's steel enclosure prevents liquids spilled on the case from entering around the door. The door itself has a long-life Neoprene rubber gasket which resists deterioration even if oil accidently comes in contact with it. The case contains no knockouts or mounting holes, outside mounting brackets being furnished.

The prescribed machine-tool type transformer, with 230/460-115 volt multiple-rated primaries, is included. This heavy-duty transformer has a built-in single-pole circuit breaker to provide short circuit protection for the control circuit. A self-contained terminal board facilitates wiring.

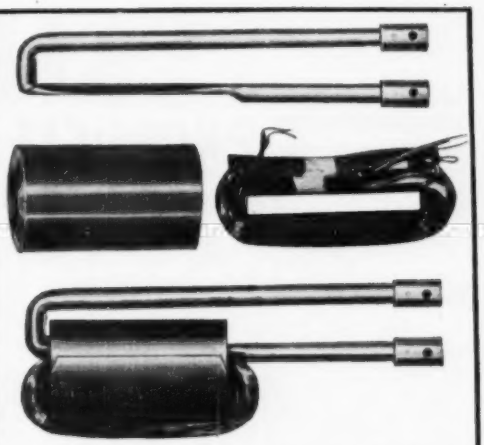
Also included in the combination starter is the new G-E a-c magnetic contactor with its strongbox coil, vertical-lift contact assembly riding in self-lubricating bearings, and other features. The new disconnect switch mounts the fuses on the front. When the door is opened, there is visible indication that the switch is in the OFF position.

(*Turn to page* 70, *please*)



G-E combination magnetic starter, showing machine-tool-type control transformer reset button being pressed. Starter pictured is nonfusible.

HEAVY, LESS EFFICIENT and slower to assemble, was the original Weller Soldering Gun composed of the parts shown. Compare these with the fewer parts at right in the new Gun, and you'll readily see why the new streamlined Weller is so popular.



THE NEW WELLER SOLDERING GUN handles 250 watts; heats, ready for use, in five seconds; has longer range to get into the tight spots, and is equipped with spot light. Uses current only when trigger is operated. It is assembled faster. Requires no bolts or nuts. The ¾" Revere Copper Rod that replaces the secondary coil in the transformer is sheared, flattened, and bent at right angles in a 200-ton press in a single operation.

COPPER TREATS YOUR PRODUCT BETTER WHEN YOU

Control Your Temper

Revere Copper Rod replaces Secondary Coil in Soldering Gun Transformer . . . reduces number of parts, makes for a speedier, more efficient assembly . . . also makes possible a lighter, more compact unit of increased capacity.

WHEN the Weller Manufacturing Company, Easton, Pa., was completing the development of its new electric soldering gun, they were confronted with this problem: The ¾" Revere Copper Rod used to replace the secondary coil in the transformer had to maintain its rigidity yet be sufficiently soft so that during the shearing, coining, and bending operations there would be no breaking or splitting of the rod.

Revere's Technical Advisory Service recommended a certain temper copper rod. It was discovered that Weller was getting a twist in the rod when it was installed in the assembled gun. Other tempers were tried and tested. Then a copper rod of a slightly harder temper than the first was recommended. That was it! Proper temper was the key. Proper temper was also the key to the .291 dia. copper rod used for the Soldering tip itself. For this, too, had to retain its rigidity and yet remain soft enough to be coined, punched, and formed without fracture.

"In addition to being extremely helpful in arriving at the proper tempers, Revere also recommended that we specify our rod in multiple lengths, and thus save considerably on scrap. They were also helpful in solving the problem of attaching the brass sleeve to the secondary rod in our Soldering Gun," the Weller Manufacturing Company tells us.

So you see, Revere's interest in your problem does not stop with the recommendation of its products. Perhaps Revere can help you. Why not take your current problem to the nearest Revere Sales Office and see?

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

* * *

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y. Sales Offices in Principal Cities, Distributors Everywhere.

NEW PRODUCTS for AIRCRAFT

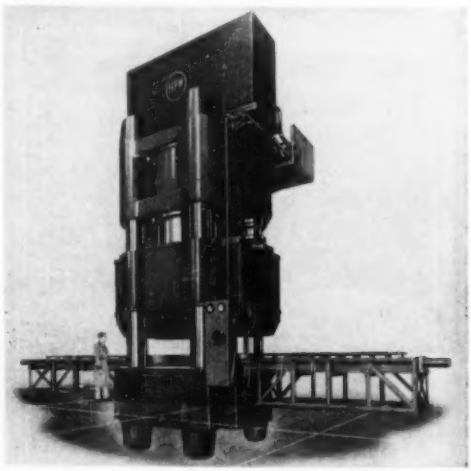
FOR ADDITIONAL INFORMATION regarding any of these items, please use coupon on PAGE 54

U-24—Rubber Pad Forming Press

In process of construction is one of the largest rubber pad forming presses reported ever to come off the design boards at the Hydraulic Press Mfg. Co., Mount Gilead, Ohio. This 7000-ton press will be used by Boeing's Seattle plant for forming large bulkheads as well as many miscellaneous small parts for the U. S. Air Forces' newest bombers.

The press operation utilizes the "Guerin" process, developed exclusively by the aircraft industry to eliminate its blanking and forming bottlenecks. In this process, the rubber pad acts as a pressing medium forcing the metal against the form or die blocks directly beneath the sheet metal. Advantage of this process is that many different parts can be made simultaneously—number and size being dependent upon the pressing surface available.

This giant press carries a rubber pad 48 in. by 120 in. and is fed by hydraulically-actuated loading tables. The loading tables play an important part in high speed part production—since new die blocks and sheet metal can be positioned on the table for loading into the press in a continuous feeding operation.



Hydraulic Press 7000-ton rubber pad forming press.

U-25—Wind Tunnel Balance

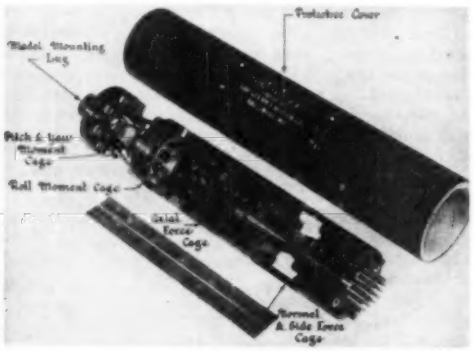
An economical wind tunnel balance that measures all six basic windage components—three moments and three forces—simultaneously, has been developed by The Glenn L. Martin Co., Baltimore, Md., for the purpose of reducing the expense and complexity of wind tunnel research.

The M-6-C balance weighing scarcely three lbs, is cylindrical in form and less than ten in. long. Installed inside the missile or aircraft model to be tested, it is declared to obviate conventional installations often costing more than $200,000, not including their expensive mechanical servicing.

An exclusive advantage claimed for the M-6-C balance lies in the fact that the correct values for each of the six components can be read off dials in the control room—directly. There is no longer any need to unscramble the several windage components and isolate them by tedious and costly mathematical computations involving days of delay, even when handled on automatic calculating machines. The data is available at once—during the actual progress of the test.

The Martin device possesses special advantages in behalf of supersonic installations, deriving from its small size and compactness, supersonic tunnels normally being very small. It also can readily be adapted for installation in a wing or other major component of the larger subsonic-type model—for the purpose of determining localized windage effects. It provides linear values in response to any load within the design's basic limitation, registering pitch, roll and yawing moments, as well as lift, drag and side forces—with less than one per cent of error.

The M-6-C balance, within its simplified steel frame, embodies the full complement of strain gage units, or cages, required to measure all these six components. Interactional effects between each component, in turn, and every one of the five other components, are evaluated in advance on a special calibration rig—and recorded in the form of standard curves, for reference purposes.



Martin six compartment strain cage wind tunnel balance, the M-6-C.

GREATER VALUE

WITH BENDIX ELECTRICAL CONNECTORS

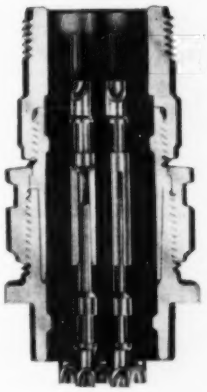
PRESSURE TIGHT SOCKET CONTACTS

PLUS

- Moisture-proof
- Radio Quiet
- Single-piece Inserts
- Vibration-proof
- Light Weight
- High Insulation Resistance
- Easy Assembly and Disassembly
- Fewer Parts than any other Connector
- No additional solder required

Outstanding design and precision workmanship assure completely pressurized electrical connectors for all sizes of contacts. A truly important feature, but only one of the many exclusive advantages that contribute toward making Bendix outstanding in the electrical connector field. Increased resistance to flash over and seepage is made possible by the use of Scinflex dielectric material—an exclusive development of Bendix. In temperature extremes, from −67°F. to +300°F. performance is remarkable. Dielectric strength is never less than 300 volts per mil. Remember, for the greatest value in electrical connectors, it pays to specify Bendix. Our sales department will gladly furnish complete information on request.

PLUS



SHELL
High strength aluminum alloy . . . High resistance to corrosion . . . with surface finish.

CONTACTS
High current capacity . . . Low voltage drop.

SCINFLEX ONE-PIECE INSERT
High dielectric strength . . . High insulation resistance.

Pin and socket arrangements available for all sizes of contacts.

Bendix

SCINTILLA MAGNETO DIVISION of
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Export Sales: Bendix International Division, 72 Fifth Avenue, New York 11, N. Y.

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• PRODUCTION • NEW EQUIPMENT • PLANT •

For additional information regarding any of these items, please use coupon on page 54

(*Continued from page 56*)

The PMCO2ST resistance spot welder is a press type machine rated at 100 KVA at 50 per cent duty cycle; operates on 220 and 440 volt three phase, 60 cycle current. Standard throat depth is 36 in., other depths being available. Welding range on low carbon steel is from 0.022 in. to 0.156 in. (two thicknesses), and on aluminum and magnesium alloys the range is from 0.025 in. to 0.081 in. Ranges for other metals vary.

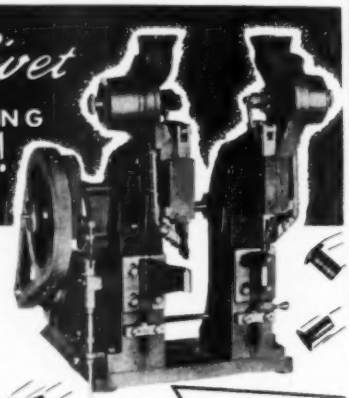
The welder design is said to eliminate spitting and electrode tip deterioration. Welding current is controlled by a continuous wave which may be altered to suit the thinnest or thickest metals within the welder's range, this current magnitude control assuring quality welds of aluminum and other alloys.

When welding two or more pieces of substantially different gage thickness, uni-directional current is used to insure proper welding. Control of current direction is by operating a simple toggle switch.

For welding of heavy gages of ferrous alloys, pulsation controls are provided. The heat and cool time as well as the total number of successive alternating pulses can be controlled. This welder also includes an adjustable pressure regulator for controlling the time at which the forging pressure is applied in relation to the peak of welding current. This assures an optimum weld quality regardless of gage thickness.

Chicago Rivet

AUTOMATIC SETTING SLASHES UNIT COSTS!



If your product involves a fastening operation—wood to wood, metal to metal, fabric to fabric, composition to composition, or any combination of these—you can slash unit costs by increasing production volume with high speed Chicago Rivet Automatic Setters and Chicago Rivet tubular or split rivets. Four rivets are automatically fed, inserted and upset at one release of the foot pedal by the quadruple model Chicago Rivet Setter. Single, double and triple setters are also available.

Bench type Double Rivet Setter with Adjustable Riveting Centers

Quick change hoppers, available as extra equipment, enable some models to switch quickly from one size and style rivet to another. Nearly all models clinch grommets, eyelets, staples and Dzus fasteners and insert drive screws—all automatically.

A Few Applications

AIRPLANE PARTS
AUTOMOBILE PARTS
BEAUTY PARLOR EQUIPMENT
BED SPRINGS
BELTS • BICYCLES
CAMERAS
CAN OPENERS
CANVAS GOODS
CARD TABLES
CASH REGISTERS
CLOCKS
COFFEE POTS
DOOR LOCKS
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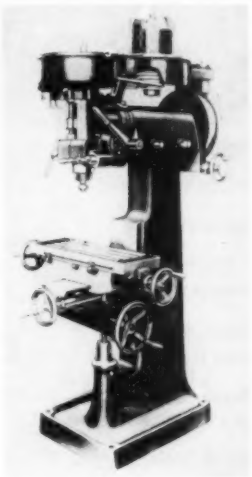
FAN BLADES
FARM IMPLEMENTS
FILING EQUIPMENT
FIREARMS
FOLDING CHAIRS
FURNITURE
GARBAGE CANS
HARNESS
INDUSTRIAL BROOMS
INSTRUMENTS
IRONING BOARDS
KNIVES
LAMPS
LAWN MOWERS
LEATHER GOODS
LOOSELEAF BOOKS
LUGGAGE
MILK BOTTLE CRATES
NOVELTIES
POTS, PANS & PAILS
PULLEYS
RADIO PARTS
REFRIGERATORS
RUBBER GOODS
SEWING MACHINES
SHOES • SKATES
STEP LADDERS
STOVES
TELEPHONES
TOASTERS • TOYS
TYPEWRITERS
VENTILATORS
WASHING MACHINES

FREE FASTENING CLINIC

If your product is small, send us an unfastened sample. If it's large, send us a sub-assembly. We will gladly analyze your fastening problem, recommend the type rivet and Chicago Rivet Automatic Setter needed and estimate production rates that can be set up on the job.

Chicago Rivet CHICAGO RIVET & MACHINE CO.
9612 W. Jackson Blvd., Bellwood, Ill.

M-75—Vertical Milling and Die Sinking Machine



New sensitive ¾ hp vertical milling and die sinking machine with ten spindle speeds having 25¼ in. by 9⅜ in. overall table dimensions and 17¼ in. under the spindle available through DCMT Sales Corp., New York, N. Y. Called C.V.A. No. 79, it is designed for high-speed light milling or die-sinking work. Push-button control is provided, and both coarse and fine feeds to spindle are available. The headstock swivels 90 deg., and there is also a sliding adjustment of the complete spindle head, providing for a variety of difficult and intricate jobs with simple tools and fixtures. A tracer arm may be used for duplicating work. Motor is 220 volt, 3 phase, 60 cycles, AC.

(*Turn to page 64, please*)

3 Advantages no maker or user of Diesels can overlook

Many things — and many men — have contributed to the progress of Diesel power. But one vital element necessary to make this efficient, economical source of power universally applicable was dependable solid fuel injection.

American Bosch was a pioneer and still is a leader in this field . . . a position established and maintained by American Bosch development and field engineering, precision manufacture, and its ever-expanding network of service agencies.

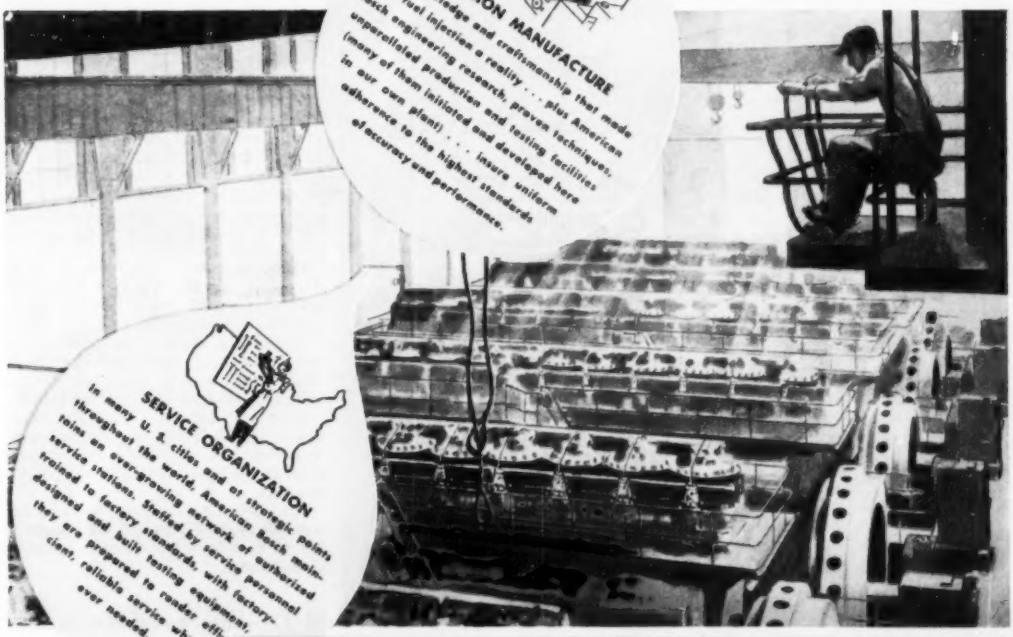
You can depend on premium performance when the fuel injection system bears the name American Bosch.

DEVELOPMENT AND FIELD ENGINEERING

American Bosch engineering departments and laboratories work constantly to improve existing products, develop new ones such as the revolutionary single plunger multi-cylinder PSB pump. American Bosch field engineers work hand in hand with engine and equipment manufacturers—from original design to test models and actual field operations.

PRECISION MANUFACTURE

The knowledge and craftsmanship that made solid fuel injection a reality . . . plus American Bosch engineering research, proven techniques, unparalleled production and testing facilities (many of them initiated and developed here in our own plant) . . . insure uniform adherence to the highest standards of accuracy and performance.



SERVICE ORGANIZATION

In many U. S. cities and at strategic points throughout the world, American Bosch maintains an ever-growing network of authorized service stations. Staffed by service personnel trained to factory standards, with factory-designed and built testing equipment, they are prepared to render efficient, reliable service wherever needed.

American Bosch

Dependable Fuel Injection for the Diesel Industry

AMERICAN BOSCH CORPORATION, SPRINGFIELD 7, MASS.

Magnetos • Generators • Voltage Regulators • Ignition Coils • Electric Windshield Wipers • Diesel Fuel Injection Equipment

NEW PRODUCTION AND PLANT EQUIPMENT

For additional information please use coupon on page 54

Snyder drill press for lightening crankshafts.

(*Continued from page 62*)

M-76—Drill Press For Lightening Crankshafts

Snyder Tool & Engineering Co., Detroit, Mich., has designed and built a special machine for drilling lightening holes in large tractor crankshafts. Specific job for which built is a crankshaft of 56 in. O.A.L., but the machine accommodates crankshafts up to 73 in. O.A.L.

When the workpiece is located in the fixture, it is clamped in place by means of a manually controlled hydraulic mechanism. The workpiece is then indexed through six stations at each of which two 1½ in. holes are drilled in the cheeks of the crankshaft adjacent to one of the throws. The indexing unit is power operated but is manually controlled, with final adjustment by means of a hand-wheel which brings the fixture into engagement with the locating pins. The machine can be set up for any desired number of stations for handling other size crankshafts. Drills up to 2 in. can be used, a change gear transmission being provided for speed adjustments. The 1½ in. drills are driven at 50 fpm and have a minimum infeed of 1 in. a minute with rapid advance and retraction. Stroke is 15 in. on both guide-bar units. Drills are high-speed steel, readily accessible for changing.

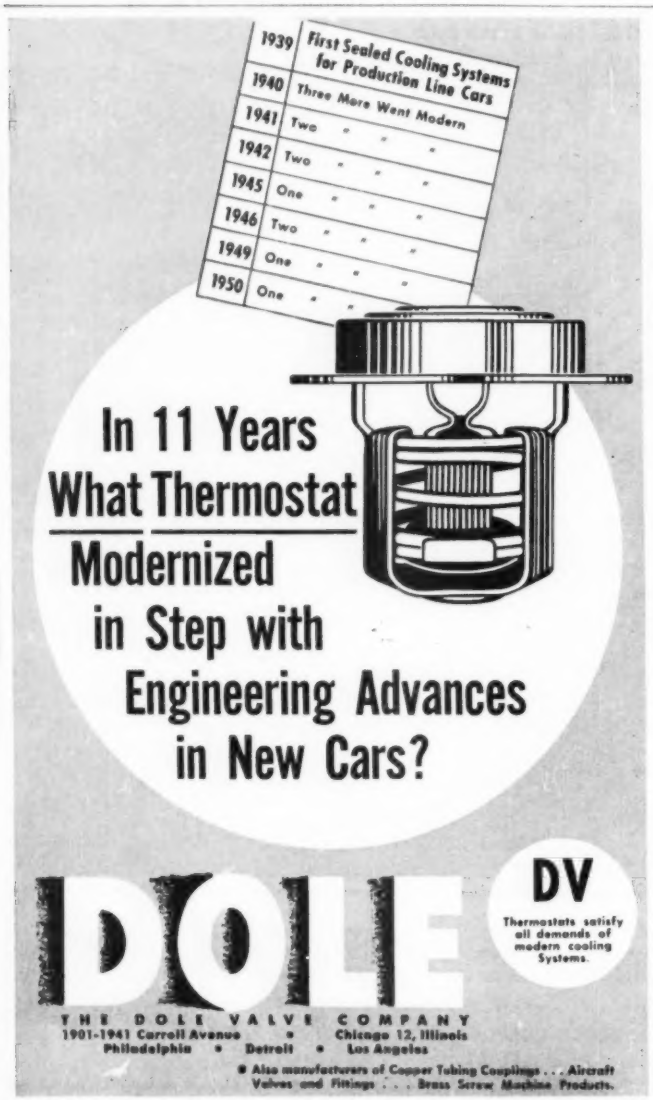
Two standard Snyder guide-bar units are used, driven by two 10 hp motors. The table is driven by a ¾ hp motor.

Locating fixtures are mounted in T-slots and are adaptable to other size crankshafts with any number of cheeks and holes to be drilled.

For safety, there is an interlock on the index mechanism and fixture, a limit switch on the index pin control unit, and a safety check on the table.

Base and column are welded steel, heavily ribbed for rigidity and thoroughly normalized. Coolant supply is in a separate tank with pump at rear of the machine.

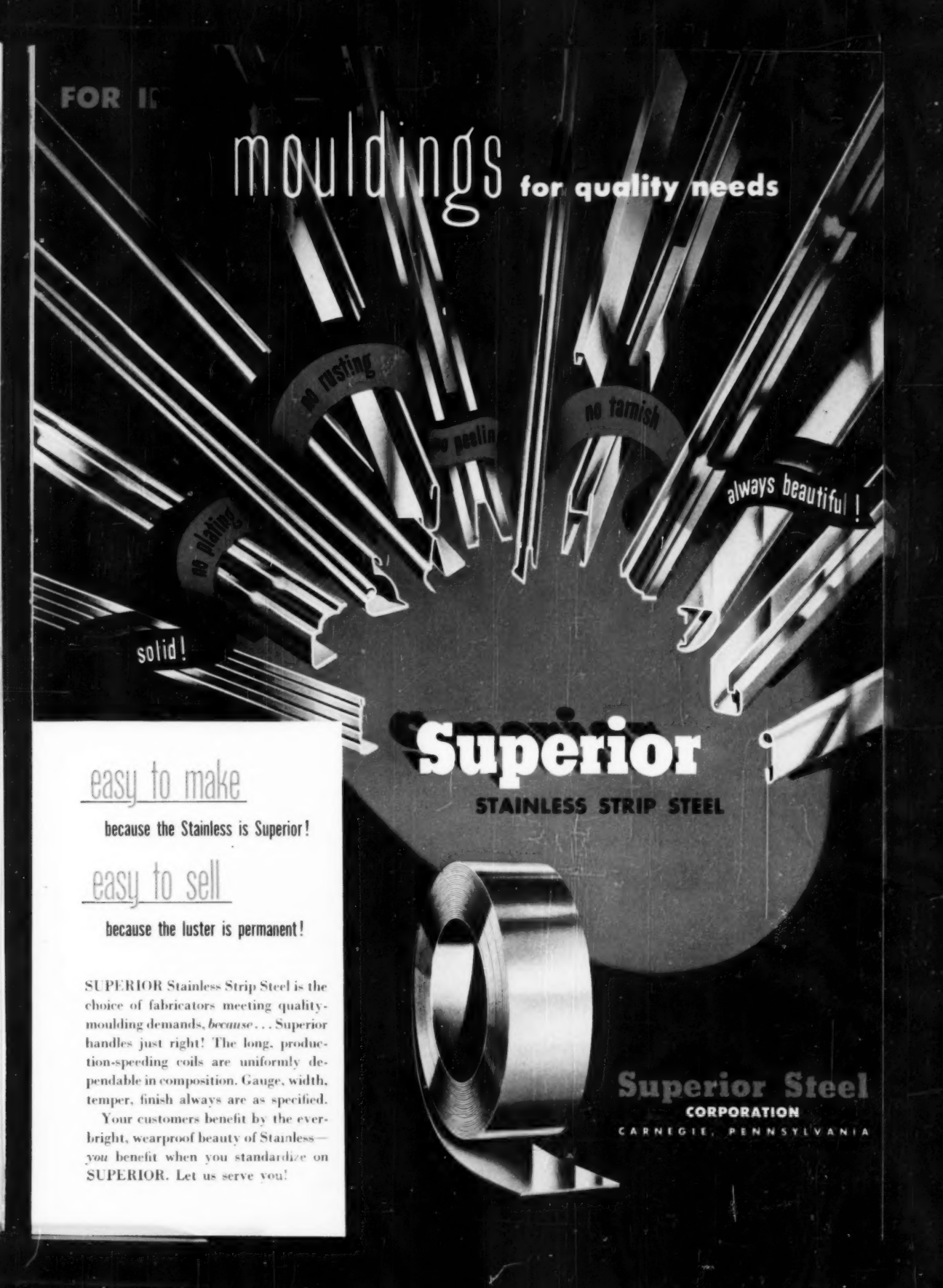
Capacity is 4.5 units per hr at 80 per cent efficiency. Necessary floor space is 184 in. by 105 in. Operation is by semi-skilled labor.


1939 First Sealed Cooling Systems for Production Line Cars
1940 Three More Went Modern
1941 Two " " "
1942 Two " " "
1945 One " " "
1946 Two " " "
1949 One " " "
1950 One " " "
In 11 Years What Thermostat Modernized in Step with Engineering Advances in New Cars?
DOLE
DV
Thermostats satisfy all demands of modern cooling Systems.
THE DOLE VALVE COMPANY
1901-1941 Carroll Avenue • Chicago 12, Illinois
Philadelphia • Detroit • Los Angeles
• Also manufacturers of Copper Tubing Couplings . . . Aircraft Valves and Fittings . . . Brass Screw Machine Products.

M-77—Improved Horizontal Boring Machines

The Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., offer heavy duty, surface hardened ways on G. & L. horizontal boring, drilling and milling machines, designed to insure continuous machining accuracy over extended periods of time, and to prevent galling and scoring in bearing surfaces. Addi-

(*Turn to page 67, please*)


FOR I
mouldings for quality needs
no rusting
no tarnish
always beautiful!
solid!
Superior
STAINLESS STRIP STEEL
easy to make
because the Stainless is Superior!
easy to sell
because the luster is permanent!
SUPERIOR Stainless Strip Steel is the choice of fabricators meeting quality-moulding demands, *because*... Superior handles just right! The long, production-speeding coils are uniformly dependable in composition. Gauge, width, temper, finish always are as specified.
Your customers benefit by the ever-bright, wearproof beauty of Stainless—*you* benefit when you standardize on SUPERIOR. Let us serve you!
Superior Steel
CORPORATION
CARNEGIE, PENNSYLVANIA

Gasoline Survey* Shows:

95% OF NEW CAR DEALERS PICK NEW BLUE SUNOCO

AS "EQUAL TO" OR "BETTER THAN" PREMIUM PRICED GASOLINE

Make your test TOUGH—Make it FAIR —then give us your HONEST OPINION

We don't want compliments unless you feel *New* Blue Sunoco has earned them. So, won't you please fill in your honest opinion and return this card to us?

I found the performance of ***NEW*** BLUE SUNOCO to be:

- ☐ Much better than
- ☐ A little better than
- ☐ Equal to
- ☐ Not as good as

} PREMIUM PRICED GASOLINE

Test made in a _____ car, _____ (Year)

You don't place yourself under any obligation whatsoever by mailing this card. We purposely have not even asked you to sign it. PLEASE BE SURE TO FILL IN AND RETURN IT, because we are most anxious to obtain the reaction of car dealers to our new product.

***THIS IS THE FORM** which 1903 new car dealers returned after they had tried New Blue Sunoco:

Here's how they rated NEW BLUE SUNOCO

24% *"Much better"*
20% *"A little better"*
51% *"Equal to"*
5% *"Not as good"*

New Blue Sunoco saves you and your customers up to 2¢ per gallon over premium priced gasoline.

NEW BLUE SUNOCO

THE HIGH TEST GASOLINE THAT SELLS AT REGULAR GAS PRICE!

NEW CAR DEALERS

New Car Dealers know that New Blue Sunoco not only gives car owners high anti-knock engine performance but saves them money over premium priced gasoline.

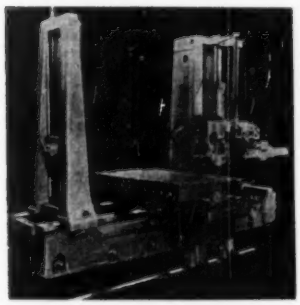
NEW PRODUCTION AND PLANT EQUIPMENT

For additional information please use coupon on page 54

(*Continued from page* 64)

tionally, a new mounting method is said to minimize transmittal to the ways of torque strains and stresses set up by temperature changes, and to compensate for vibration created by other industrial machines located near the G. & L.

All ways are precision fitted to their mounting surfaces and held both flat and parallel throughout their entire length. A controlled heating procedure produces ways that are free from checks, scale and internal brittleness, the company points out, and produces an unusual depth of hardness.



Giddings & Lewis horizontal boring machine.

Surface hardening is obtained with a new process by which, during the hardening operation, ways are held in a fixture which duplicates the actual mounting surface used on the machine component. This fixture coupled with a rapid heating cycle prevents way distortion. Heating and quenching are uniform throughout the way. After hardening, the ways are precision ground.

The improved method of way mounting embodies a tongue on the mounting surface of the machine bed, saddle or runway which slip-fits into a channel on the under surface of the way. The way actually rests on broad hand-scraped shoulders located on either side of the tongue which forms an integral part of the basic machine casting. The way is locked in place on the mounting surface by double dowel pins, inserted through the way and into the casting tongue from both sides.

These horizontal boring, drilling and milling machines with the new hardened ways on the bed, saddle, column, and runway include floor type, table type and planer type machines.

M-78—High-Production Oil-Hydraulic Press

A high-production 50-ton oil-hydraulic multipress announced by the Denison Engineering Co., Columbus, Ohio, provides speed and control features in this floor model said to be available for the first time in a press of this tonnage. Embodying precision adjustments for multiple ram action, this 50-ton press extends the range of standardized, self-contained oil-hydraulic presses in this line beyond the widely used units of 1 to 35-ton capacity. It has a 15 in. stroke, 24 in. daylight opening, and a work surface of 31 in. by 19½ in.

Approach of the ram to the work is variable and can be preset at any speed up to maximum of 290 ipm, with pressing speeds up to 145 ipm. Approach and pressing speeds are independently adjustable, permitting rapid traverse with slow entry of punch into dies, and similar combinations for exacting work requirements. Ram stroke length and pressure can be preset, and either pressure or distance reversal is a feature.

The press may be equipped with a choice of controls including dual hand lever, single lever, foot pedal or electric push-button type. It is available in

(*Turn to page* 68, *please*)

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Professional Tape Recording Equipment For Your Special Research Needs

HIGH FIDELITY—50 to 15 KC

No other recorder offers such a wide frequency range at such a low price. Special models to fit your special needs for

Noise Analysis ● Vibration Tests
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Magnecord tape recordings accurately capture electronic data and test sounds just as they happen, provide a complete record of the evidence for comparison and future reference. No chance for human error . . . Magnecorder gets it right the first time!

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Magnecorders are sturdy, give perfect reproduction under the most difficult conditions. Easy to operate and trouble-free. Lightweight . . . one man can carry a Magnecorder anywhere!

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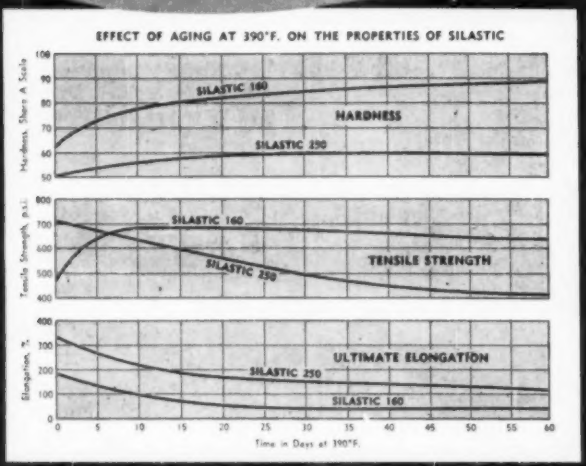
Magnecorders are moderately priced for every industrial application. Find out how "sound" research with Magnecorder can help improve your product.

Long after organic rubber melts or becomes brittle...

SILASTIC* still stays Elastic!



We're talking about an elastomer that retains its rubbery properties at temperatures far above and far below the limits of any other elastic material. That is indicated by the effects of accelerated aging at 350°F. on the properties of two typical Silastic stocks with brittle points in the range of —70° to —130°F.

Silastic is being widely used at temperatures in the range of 250° to 600°F. and at temperatures ranging from —75° to below —100°F. It shouldn't be called a rubber because that term invites comparisons that are not valid. At room temperatures, the physical properties and abrasion resistance of Silastic are well below the values normally associated with rubber. Conversely, at temperatures well within the serviceable limits of Silastic, rubber rapidly becomes a soft gum or a brittle solid.

The important thing about Silastic is that it retains its physical, chemical and dielectric properties over a temperature span of about 600 Fahrenheit degrees. When you need rubbery properties or good dielectric properties in a resilient and flexible material at temperatures beyond the limits of ordinary rubber, investigate Silastic.

*T. M. REG. U. S. PAT. OFF.

SEND TODAY! for your copy of Silastic Facts No. 10 containing new data on the properties, performances and applications for all Silastic stocks.

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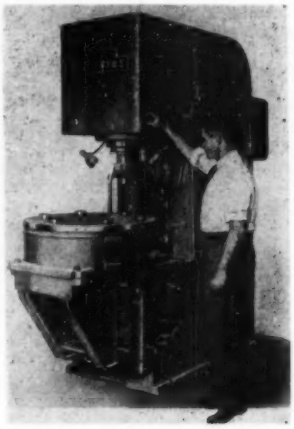
NEW PRODUCTION AND PLANT EQUIPMENT

For additional information please use coupon on page 54

(*Continued from page 67*)

manual and automatic models for single cycling, continuous cycling, or vibratory repeat strokes. Automatic ram cycling also may be used in conjunction with variable speed approach, and interlocking hydraulic accessories. Added advantages include inching control of ram for quickly locating dies and tooling during set-up periods.

A large 33 in. diam hydraulic index table, may be installed, which moves parts under the press ram automatically and provides indexing for either 6



Denison high-production 50-ton Multipress.

or 12 stations. Parts can be loaded onto the table stations at front of the press, eliminating waiting periods for completion of work cycles. The revolving table, synchronized hydraulically with the ram action, accurately positions the parts at the pressing stations. Provision is made for "skipping" non-tooled stations on the index table.

Readers of
AUTOMOTIVE INDUSTRIES
are always
WELL
INFORMED

DIFFERENT CONSTRUCTION . . .

DURABLE PERFORMANCE

DUREX-100 ENGINE BEARINGS

It's the essential difference in their construction that enables Durex-100 engine bearings to out-perform and outlast all other types. This difference lies in the method used to bond the bearing metal to the steel back.

Here's how this is done. Moraine first applies a layer of copper and nickel metal powders to the steel back. These particles are then bonded together by the sintering process to form a porous matrix integrally brazed to the steel back. When the high lead babbitt is cast, the molten metal penetrates the matrix.

This process gives Durex-100 bearings a definite advantage over the conventional type of bearing, where embedability is limited to the thickness (a few thousandths of an inch) of the babbitt alone. The depth of the Durex-100 babbitt overlay combines with the much greater depth of the matrix to provide a far superior embedability. It affords complete protection against damage from large particles of foreign metal that get into a bearing.

Both in actual use and exacting tests, Durex-100 bearings have proved their unique ability to last longer. They are used as original equipment on Cadillac, Buick, Oldsmobile, GMC, and other leading makes of cars and trucks. Why not find out now how you can apply the advantages of Durex-100 to your engines?

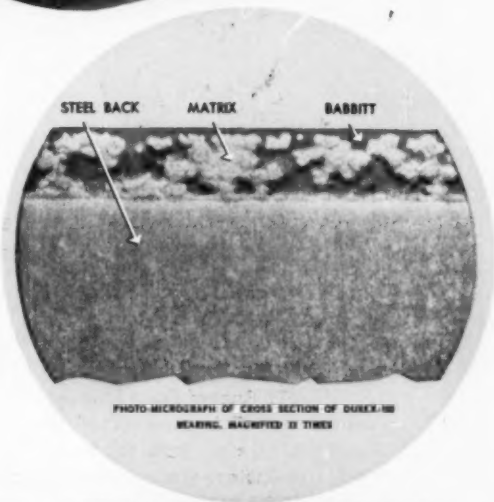


PHOTO-MICROGRAPH OF CROSS SECTION OF DUREX-100 BEARING, MAGNIFIED 11 TIMES

THE MATRIX MAKES THE DIFFERENCE

Steel-backed intermediate matrix of porous copper-nickel bonds mechanically, as well as metallurgically with thin high lead babbitt overlay.

MORAINE PRODUCTS
DIVISION OF **GENERAL MOTORS**
DAYTON, OHIO

Durex-100 Engine Bearings by Moraine

NEW PRODUCTS

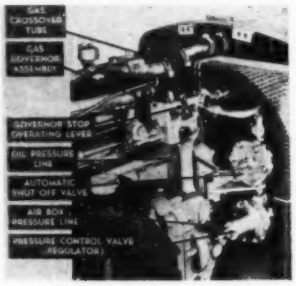
For additional information please use coupon on page 54

(*Continued from page 58*)

P-123—Dual-Fuel Diesel Engines

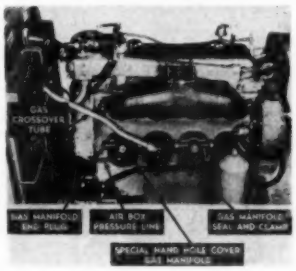
The Detroit Diesel Engine Division of General Motors Corp., Detroit, Mich., offers a new option on Series 71 Diesel engines which enables them to burn natural gas in accordance with true Diesel high-compression principles. The option is available both on new engines leaving the factory and engines already in use. For the latter a factory-engineered kit is available for the changeover. The changeover permits the engines to burn either natural gas with a pilot charge of Diesel fuel or Diesel fuel alone. There is no interference with the operation of the unit as a straight Diesel fuel engine when required.

Change from Dual fuel to Diesel fuel



Close-up of GM Diesel Dual-fuel unit showing changes required on blower side of engine. The lever on gas governor assembly effects instant changeover from Dual-fuel only, to straight diesel or partial Dual-fuel operation.

operation is accomplished instantly by moving a small lever on the gas governor assembly. When the lever is in the forward position the engine operates either on straight Diesel fuel or on gas (with a pilot charge of Diesel fuel) depending on the availability and pressure of gas in the line. This is important to owners who operate their units both in natural gas areas and in areas where natural gas is not available, the company points out. The


GAS CROSSOVER TUBE
GAS MANIFOLD END PLUG
AIR BOX PRESSURE LINE
GAS MANIFOLD SEAL AND CLAMP
SPECIAL HAND HOLE COVER GAS MANIFOLD

Close-up of GM Diesel Dual-fuel unit showing changes on manifold side of engine for converting standard Series 71 model to the use of natural gas.

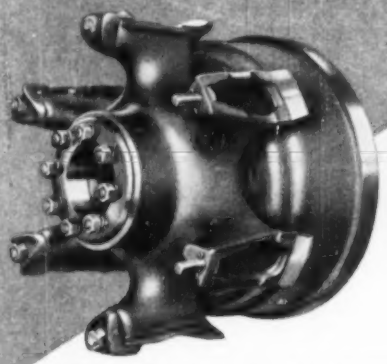
changeover permits the added economy of natural gas whenever available, and affords maximum flexibility between the two forms of operation.

The Dual-fuel unit has no electrical ignition system. Natural gas is delivered to the cylinder and fired by a small charge of Diesel fuel at the top of the compression stroke. The engine instantly adjusts itself between the use

(*Turn to page 74, please*)

GUNITE CAST STEEL WHEELS

STRONGER...LIGHTER



for HIGHWAY TRUCKS TRAILERS

TUBULAR-SPOKE, CAST ELECTRIC-STEEL WHEELS offer you maximum strength...minimum unsprung weight

More and more automotive engineers are demanding the advantages of GUNITE Wheel Assemblies for trucks and trailers. The GUNITE Wheel offers light-weight design with the proven strength and rigidity of cast electric-steel. The GUNITE Rugged Brake Drum prevents brake troubles, provides more efficient braking and offers lower cost per mile. These two together form the GUNITE Wheel Assembly which is available to fit most standard truck and trailer axles.

WRITE FOR GUNITE WHEEL INFORMATION

FERROUS CASTINGS FOR THE AUTOMOTIVE INDUSTRY

Gunite (Processed Gray Iron) · Malleable · Electric-Steel

Brake drums, cylinder liners, cam shafts, crank shafts and other automotive castings are made to your specifications. GUNITE provides you with castings of the best ferrous material to fit your requirements.

GUNITE FOUNDRIES CORPORATION

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GUNITE

INTERNATIONAL HARVESTER model L-205 Roadliner Tractors can handle the most difficult grades with ease.
The powerful I. H. C. 450 cubic inch engines are equipped with the Holley 852FFG Carburetor-Governor combination which insures positive power control without loss of horsepower.
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DETROIT 4
For Half a Century — Original Equipment Manufacturers for the Automotive Industry

Carilloy "T" Steel greatly

ON THE MARION 5561 — WORLD'S LARGEST POWER SHOVEL

THE mammoth 45 cubic yard bucket on Hanna's "Groundhog" is moving more than a million yards of overburden every month. Despite the exceptional punishment it receives, the U·S·S CARILLOY T-Steel lip-plate has already been in service much longer than any steel previously used.

Further, the higher physical properties of T-Steel have made possible design changes which are now under way and which should greatly extend lip life beyond present construction.

Here's what Hanna Coal Company says, as owner and operator, "The lip of this bucket (made from 4½" CARILLOY T-Steel) is one of the most critical sections and it takes a great deal of punishment when loading the rock strata we have at this location. At Marion Power Shovel Co., we have a *50-yard* bucket on order. It will be built almost entirely of T-Steel . . ."

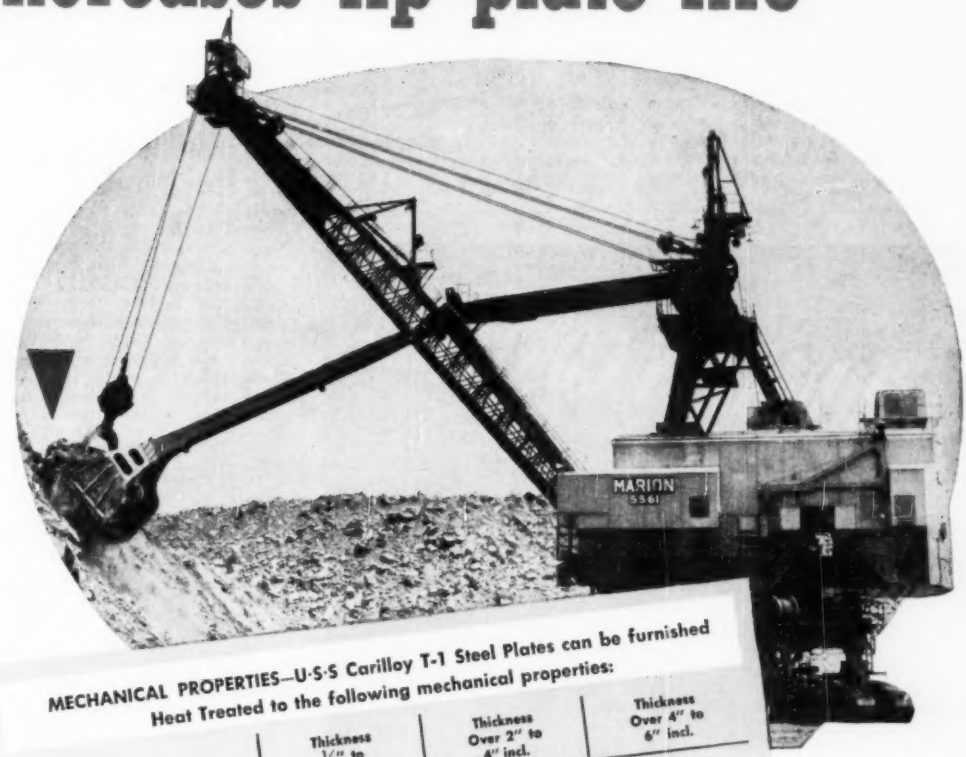
In this new bucket, CARILLOY T-Steel will increase capacity 5 yards — almost *9 tons* — by cutting weight without any sacrifice in strength. And because it can be welded *in the field*, T-Steel construction makes it unnecessary to shut the shovel down for the many hours formerly required for shop repairs.

CARILLOY T-Steel, a product of United States Steel research, is a *low carbon* alloy steel, heat-treated with great precision. Minimum yield strength is 100,000 psi (for plates ¼" to 2" inc.) Furthermore, T-Steel will remain ductile at arctic temperatures—*even after welding.*

Welding does not lower the strength of the plate. If AWS electrodes E-12015 or E-12016 are used, welds remain 100% strong . . . both butt and fillet-welded specimens will break completely outside of the heat-affected area. As for toughness, laboratory tests have proved that, even after gas-cutting, T-Steel can be bent at more than 100°F. below zero.

CARILLOY T-Steel is normally produced in the forms of plates and bars. Nominal hardness is 250 Brinell, although 321 minimum Brinell can be furnished for abrasive conditions where a combination of high hardness, toughness and weldability is essential.

increases lip-plate life



MECHANICAL PROPERTIES—U·S·S Carilloy T-1 Steel Plates can be furnished Heat Treated to the following mechanical properties:

	Thickness ¼" to 2" incl.	Thickness Over 2" to 4" incl.	Thickness Over 4" to 6" incl.
Yield Strength, 2% Offset (min.)	100,000 psi	90,000 psi	90,000 psi
Tensile Strength (min.)	115,000 psi	105,000 psi	105,000 psi
Elongation in 2", % (min.)	18	17	16
Reduction of Area, % (min.)	55	50	45
	Thickness ¼" to ½" incl.	Thickness Over ½" to 1" incl.	Thickness Over 1" to 2" incl.
Cold Bend	180°D=1t	180°D=2t	180°D=3t

(Testing in accord with A.S.T.M. recommended practices.)

CARNEGIE-ILLINOIS STEEL CORPORATION, PITTSBURGH

COLUMBIA STEEL COMPANY, SAN FRANCISCO • TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM

UNITED STATES STEEL SUPPLY COMPANY, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST • UNITED STATES STEEL EXPORT COMPANY, NEW YORK

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Carilloy Steels

ELECTRIC FURNACE OR OPEN HEARTH • COMPLETE PRODUCTION FACILITIES IN CHICAGO AND PITTSBURGH

UNITED STATES STEEL

NEW PRODUCTS

(*Continued from page 70*)

of natural gas (with a pilot charge of Diesel fuel) and straight Diesel fuel in case the gas pressure falls off partially or completely. An automatic shut-off valve activated by the rise and fall of engine oil pressure cuts off the flow of the gas when the engine is not in use.

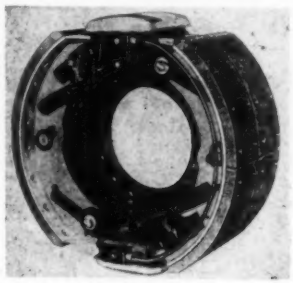
The performance of these units on "sour gas" (natural gas with a high content of undesirable chemical elements) or "LP" gases has not been fully established. To date the factory has recommended their operation only on natural gas.

For additional information please use coupon on page 54

According to Detroit Diesel, the advantages of the Dual-fuel engine as developed in the field are added fuel economy in areas of abundant natural gas; instant changeover from Dual fuel to straight Diesel operations; quick response to load (a characteristic of the GM 2-cycle Diesel) and lowered upkeep due to non-sludging properties of natural gas as a fuel.

P-124–Balanced-Shoe-Action Hydraulic Brakes

FR Series hydraulic brakes for medium and heavy duty trucks, tractors, trailers, and buses, manufactured by the Automotive Div. of Wagner Electric Corp., St. Louis, Mo., embody four points designed to provide high stopping power. First, the drum-excited balanced shoe action of the brakes multiplies brake stopping power regardless of direction of drum rotation, each shoe being excited independently, by the drum. Second, brake shoes are automatically self-centering because anchor surfaces are aligned with the axle radius, and there is an absence of anchor pins that are fixed. Third, two wheel cylinders in each drum apply equal amounts of hydraulic pressure to each end of each brake shoe. And fourth, the absence of intermediate levers, fixed anchor pins, and large abutted surfaces permits practically all of the hydraulic pressure to be used to produce stopping torque, since internal friction losses are minimum.



Wagner Electric heavy duty dual type rear hydraulic brake, Type FR2SD.

Type FR2SD heavy duty rear brake (illustrated) is a dual type equipped with two sets of fabricated steel shoes and "siamese-twin" wheel cylinders. These mount on a spider. Separate dust shield enclosures are available. Shoe adjustment is by means of worm, worm wheel, and adjusting screw for each brake shoe, mounted in the spider anchor supports. Each set of two shoes may be adjusted individually or simultaneously with a ⅝ in. hex. wrench. Dual shoes gain advantages over single wide shoes in compensating for "bell-mouthing" to offset the greater distortion inherent in a wide drum. They also

"Quality Control" is the means by which TUNG-SOL Auto Lamps are rigidly held to highest standards. It is the reason why the enormous volume of TUNG-SOL Lamps required by automobile manufacturers and the replacement trade is so uniform and dependable year after year.

Quality Control is an independent inspection unit operating within the TUNG-SOL organization. It examines and tests continuously all along the line of manufacture. It has the authority to reject one lamp, or a day's production should they fail to measure up to specifications.

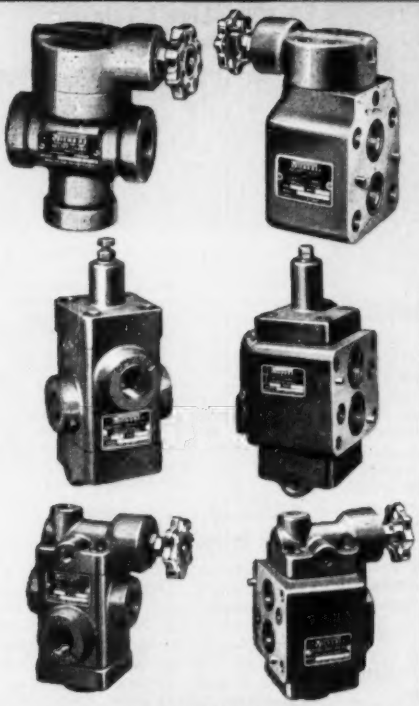
This rigid self-discipline is to our customers' benefit, therefore to our advantage. It serves to make the trademark TUNG-SOL a symbol of quality in miniature lamps and all glass sealed beam headlights.

TUNG SOL LAMP WORKS INC., Newark 4, N. J. SALES OFFICES: ATLANTA CHICAGO • DALLAS • DENVER • DETROIT • LOS ANGELES • NEWARK • PHILADELPHIA

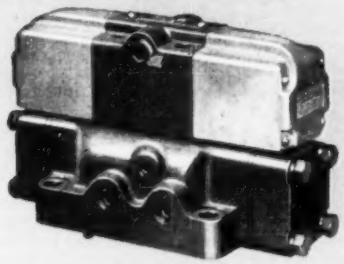
TUNG-SOL AUTO LAMPS

ALSO SIGNAL FLASHERS AND ELECTRON TUBES

VICKERS PRESSURE CONTROL and DIRECTIONAL CONTROL VALVES



Vickers maximum pressure (relief) valves, pressure reducing valves, and sequence valves are constructed to limit maximum pressure adjustments within nominal working pressure range. Wires and seals can be used after final adjustment for locking.



Vickers pilot operated solenoid controlled, 2 and 3 position—4 connection type valves have oil- and water-tight solenoid enclosures and individual solenoid leads with terminals.

Conduit mounted styles have pressure sealing type gaskets at connections in mounting face. Locating pins are also provided in mounting face.

Give you the advantages

of J.I.C. Industrial Hydraulics Standards

The "Joint Industry Conference Hydraulics Standards for Industrial Equipment" have definite benefits for both the user and builder of machine tools and many other kinds of equipment. As these standards are directed toward assuring uninterrupted production of the machine, safety of personnel and longer equipment life (all without stifling hydraulic development), Vickers are participating in the J.I.C. program.

Shown at the left are representative Vickers Valves that comply with J.I.C. Standards. These valves embody proven design and construction features that provide dependability, greater accessibility for maintenance, simplification of piping and reduced installation costs. For further information ask for Catalog 5000.

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Incorporated
DIVISION OF THE SPERRY CORPORATION

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✓	ENGINEERING RECOMMENDATIONS

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319 SO. EARL AVE. LAFAYETTE, INDIANA

NEW PRODUCTS

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improve equalization of lining surface pressures over the entire drum width, it is pointed out.

P-125—Link Chain Lifter and Puller

Link chain model Pul-Lift, placed on the market by the Phila. Div. of the Yale & Towne Mfg. Co., fits thousands of applications requiring hoisting or pulling work, positioning, stretching wire or cable, etc. As simple to operate as a wrench, its light weight makes it easily portable to the job. At any point of the lifting action, the load is safely supported by a positive, self-actuating load brake. The device has safety top and bottom hooks that open slowly without fracture when overloaded. Bottom hook is ball bearing mounted for swiveling. This link chain Pul-Lift is available in ¾, 1½, and 3 ton capacities.

P-126—New Synthetic Staple Fiber

Announced by Union Carbide and Carbon Corp., Textile Fibers Dept. of the Carbide and Carbon Chemicals Div., New York, N. Y., is the company's latest addition to textile fibers —dynel. Basically an economical fiber, dynel is made from two important inexpensive large-volume synthetic organic chemicals — vinyl chloride and acrylonitrile. It presents a combination of qualities not found in any natural fiber.

As a basic fiber it is strong, pliant, and tough, not supporting combustion, and resisting stains, molds, insects, and many chemicals. Other characteristics are mildewproofness, mothproofness, strength wet or dry, dimensional stability, rapid drying, warmth, resilience, and dyability.

A true synthetic fiber, dynel is extruded to size and cut to length. Finished dynel fabrics can be as soft as cashmere or harsh as mohair.

Limited industrial use is now found for the fiber in work clothing, filter cloth, water softener bags and dye nets, until adequate fiber production can be reached. Use for aircraft trim cloth is at present, however, being exploited. Use for automobile upholstery is a potential for the future, waiting on the demands of great quantity production required.

(*Turn to page 78, please*)

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NEW PRODUCTS

For additional information please use coupon on page 54

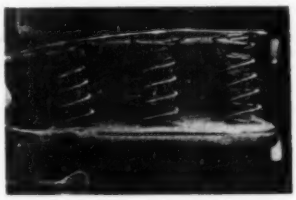
(*Continued from page 76*)

P-127—Improved Cushion And Back Seating Units

A development in automobile cushion and back seating units, for improving riding comfort and making possible luxury seating in lower priced cars, introduces Masonite Presdwood into the coil spring cushion and back seating units as a solid foundation panel. Result is production economies, large savings in critical steel and burlap, soundproof and better riding, plus installation economies for automobile manufacturers, say the manufacturers, L. A. Young Spring & Wire Corp., Detroit, Mi h. Basically, this advance was made possible by discovering a method of stapling coil springs to the Masonite Presdwood and stapling that portion of the assembly to steel tubing.

The use of Presdwood will bring about a reduction of more than 25 per cent in the corporation's use of steel for seating units. Elimination of burlap, a critically-short imported material, was made possible by adapting the "flocking" process to the entire unit as a sound-proofer, stabilizing agent and rust preventive.

Instead of using 2½ to six sq yds of burlap to wrap the individual coil springs to keep them silent, this material is entirely eliminated. Substituted is one-third of a sq yd of American-made canvas to bridge the space between the springs and the tube in the front cushion.



Side view of Young radically-different automobile cushion unit, "flocked" with sound-proofing rayon fibers. Both coil springs and tubular framework are stapled by a process used for the first time, to a panel of Masonite Presdwood which serves as the bottom of the cushion unit (shown above) and the back (partly visible).

Flocking, hitherto never used in seating, is the process of causing minute fibers, usually of textiles, to adhere to a surface which has been treated with an adhesive. The Young Corp. will use rayon fibers, colored to the specifications of its customers, in flocking the new units.

With introduction of the new unit, L. A. Young Spring & Wire Corp., for the first time is engaging in the manufacture of steel tubing. This manufacturing operation will enable the corporation to furnish automobile plants with a complete coil spring cushion and back assembly in a "package." Use of tubing eliminates front cushion and back frames made of stamped metal.

The coil springs are resiliently joined together at the top by the use of small helical coils and rubber cord. The result is a free-acting unit with no hammocking condition. Young-developed flat border wires are attached, and then the entire assembly is completely coated with a rubber base adhesive. Before the adhesive dries, the unit enters a chamber in which rayon flock is homogeneously suspended in air under pressure. The rayon fibers adhere to the tacky adhesive. With its covering of "flock" the unit then moves into the drying oven. The result is a cushion and back spring with never-slip parts and unbelievable quietness, it is said.

In the front seat back, the Presdwood foundation supplants the padding formerly used by upholsterers to protect the upholstery from metal contact. Four rows of coil springs are used, the top

(*Turn to page 82, please*)

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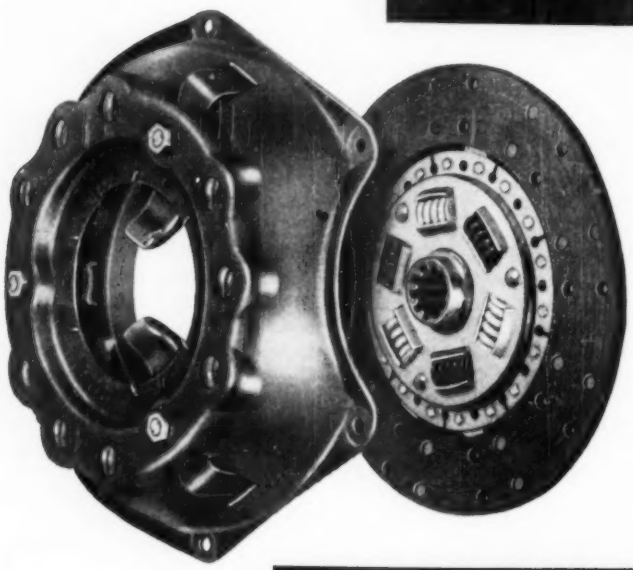

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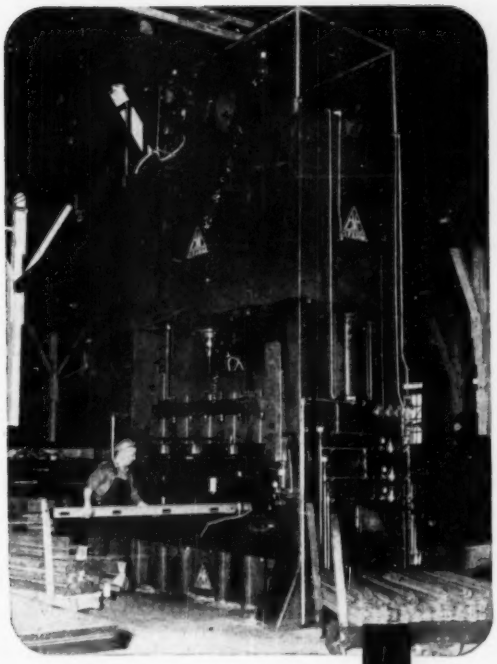

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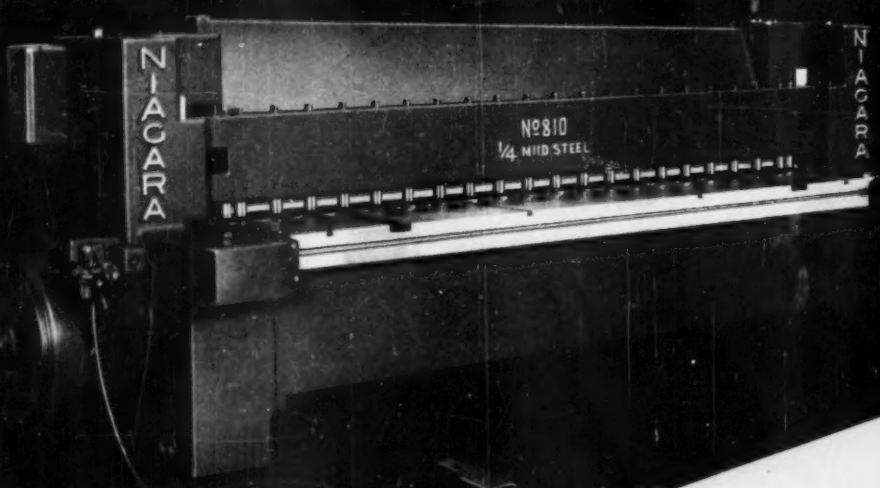

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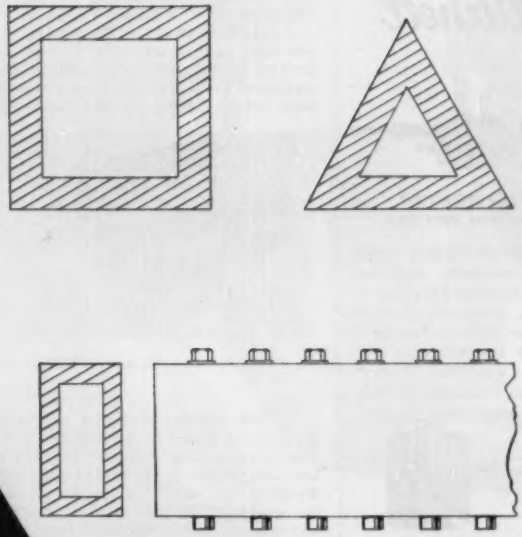

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NEW PRODUCTS

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(*Continued from page 78*)

row being flat-sided "super-edge" coils that eliminate the burlap cover which had been used to prevent the padding from working into the coil springs.

The number of rows of coil springs in a cushion can be reduced from as many as six to three, of particular advantage in front cushions, as more toe room is provided for rear seat passengers.

The Masonite Presdwood bottom for the front cushion will make it unnecessary for auto manufacturers to insert a sheet metal baffle plate so that warm air from the heater will flow into the rear section of the automobile and not into the front cushion springs.

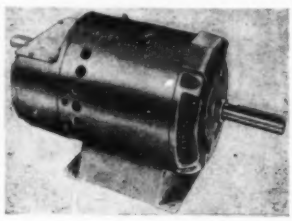
The Presdwood forming the rear back serves a dual purpose. Sound-proofed by the flocking process, the Presdwood becomes an acoustical divider between the car interior and the trunk. Auto manufacturers have been using cardboard or similar material.

It is said that upholsterers will find the new units without rough edges that previously have torn fabrics and caused injuries. The new design will be available either in removable or non-removable units.

P-128—Reversing Magnetic Clutch Transmission

Vickers Electric Div. of St. Louis, Mo., comes forward with a new reversing or two-speed Magneclutch. This Magneclutch provides two driving members and only one driven member. The two driving members rotate continuously in opposite directions, and a simple reversing drive, which is controlled by energizing the proper excitation coil, is achieved.

A feature is the single, low-inertia driven member. Because of this there is no backlash in the output shaft. The gearing arrangement used, to cause the driving members to rotate in opposite directions from a unidirectional input, need not be limited to any particular



Vickers reversing Magneclutch, 32D22.

ratio. For machine tools, for example, the gearing would be arranged to give a suitable cutting speed in one direction and faster speed in the opposite direction for return travel. Then, too, the gearbox may be omitted entirely and each of the driving members connected directly to separate sources of power.

A further extension of the dual-driving-member single-driven-member design is a two-speed transmission (accomplished by driving the input members at different speeds in the same direction). This arrangement is particularly advantageous for remote control since the excitation power is low and three small wires can easily carry the current over long distances. The two speeds may be almost the same or, since Magneclutches operate over a wide speed range, they may be widely different.

In applying a reversing or two-speed Magneclutch, any slip losses are dissipated in the clutch.

Applications of Vickers Magneclutch transmissions include drives for machine tools such as lathes, shapers, milling machines, broaching machines, planers, drilling and tapping machines; servomotors; process controls; lifts and hoists; lift trucks; auger machines; door operators; arbor presses; etc.

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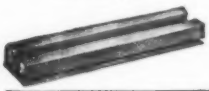

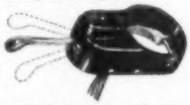

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Mitchell 6-wire concentric type semi-automatic turn signal switch used in passenger cars.

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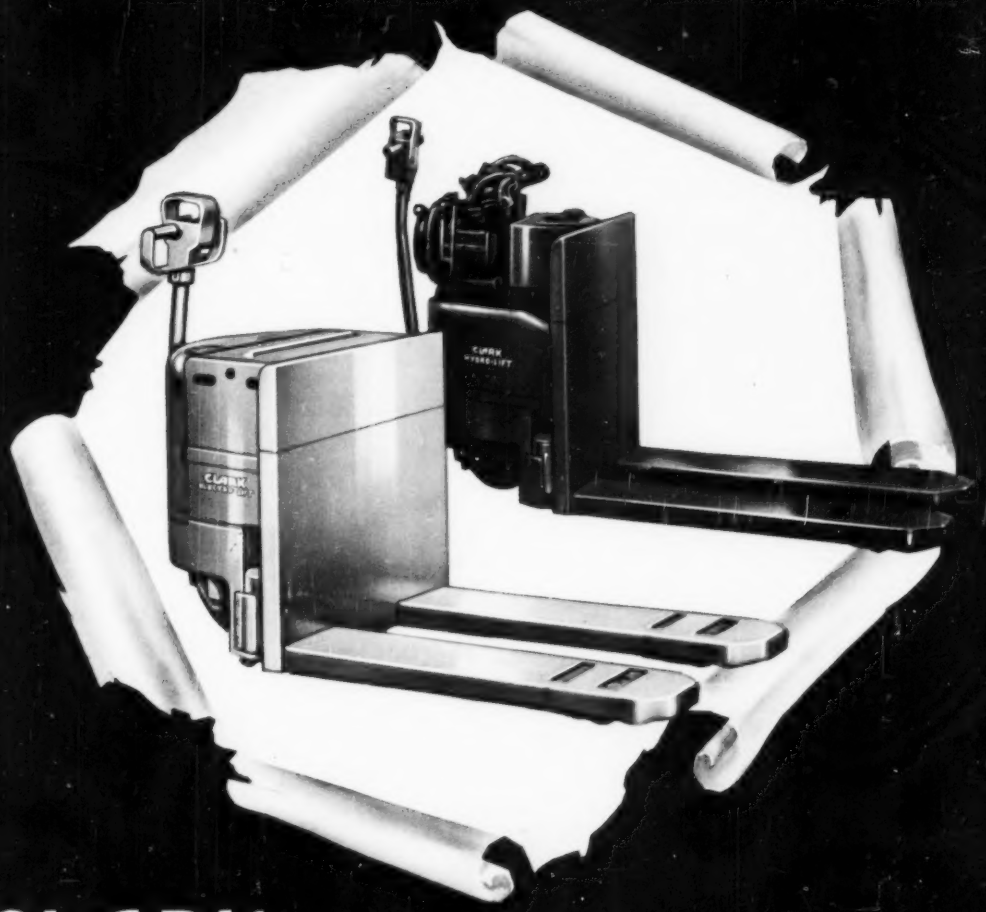

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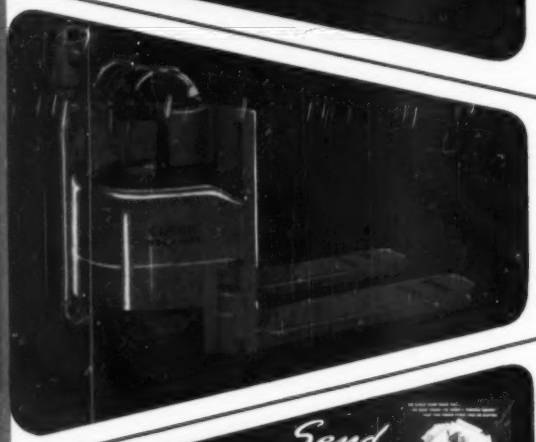

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Business in Brief

Written by the Guaranty Trust Co., New York, Exclusively for AUTOMOTIVE INDUSTRIES.

General business activity in mid-November continued at a level substantially above that a year ago. Increases during this period were reported in department store sales, bituminous coal production, construction, and electric power output, while crude oil production and railway freight loadings declined. For the week ended Nov. 18 the *New York Times* index of activity stands at 171.4, a new high level, as compared with 167.6 in the preceding week and 142.7 a year ago.

The dollar value of department store sales in the week ended Nov. 18, as reported by the Federal Reserve Board, was equal to 368 per cent of the 1935-39 average, as compared with 342 in the week before. At this level, the value of sales was seven per cent more than in the comparable week of last year. The total reported since the beginning of the year was five per cent more than the corresponding sum in 1949.

Production of bituminous coal and lignite in the same period is estimated at 12,000,000 net tons, 1,015,000 more than output in the week before but 2,583,000 less than the comparable amount last year.

Civil engineering construction volume reported for the six-day week ended Nov. 16, according to *Engineering News-Record*, was $215 million, as compared with $102 million in the preceding four-day week. The total recorded since the beginning of the year, at $10.4 billion, is 45 per cent more than that in the corresponding period of 1949.

Production of electric power rose moderately during the week ended Nov. 18. At 6728 million kilowatt-hours, total output was 19.2 per cent above the amount a year earlier, as compared with an advance of 21.0 per cent shown in the preceding week.

Crude oil output in the week ended Nov. 19 averaged 5,882,400 barrels daily, 28,300 less than in the preceding week but 671,350 above production for the similar period in 1949.

Railway freight loadings in the week ended Nov. 18 totaled 837,065 cars, 0.3 per cent less than the figure for the week before but 10.3 per cent more than the corresponding number a year ago.

The wholesale price index of the Bureau of Labor Statistics for the same period, at the new record level of 171.2 per cent of the 1926 average, was 0.1 per cent more than in the preceding week and 12.9 per cent above the comparable figure for 1949.

Member-bank reserve balances decreased $432 million during the week ended Nov. 22. Underlying changes thus reflected include increases of $200 million in Treasury deposits with Reserve banks, $154 million in money in circulation, and $43 million in non-member bank deposits and other Federal Reserve accounts. Decreases of $51 million in the monetary gold stock, $23 million in Treasury cash, and $9 million in Reserve-bank credit were also reported.

Total loans and investments of reporting member banks increased $41 million during the week ended Nov. 15. An advance of $237 million in commercial, industrial, and agricultural loans was recorded. Total business loans, at $16,947 million, were $3171 million more than the comparable sum a year ago.

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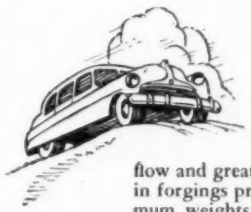

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New Magnetic Clutches Use Iron-Graphite Mixture

A RECENT development of Eaton Manufacturing Co. is the use of dry graphite powder mixed with fine magnetic powder in electro-magnetic clutches and brakes. This latest development complements the line of eddy current couplings, brakes, dynamometers, etc., made by Eaton's subsidiary, Dynamatic Corp.

There are two basic designs of Eaton's electro-magnetic devices, common to each of which is a magnet coil and complete magnetic circuit. One type maintains a fixed air gap between the rotating members into which iron and graphite particles are drawn magnetically when the current is applied. The other type has a variable air gap and is similar to a disk-plate clutch in which the iron and graphite particles are magnetically drawn between the plates as they are magnetically closed, thereby renewing the "friction linings" each time the current is applied.

In Fig. 1 is shown the type with fixed air gap. When the magnet coil is excited, the powdered iron-graphite mixture is drawn into the fixed space separating the drum and electro-magnetic field, where it is literally frozen between these surfaces. This provides a

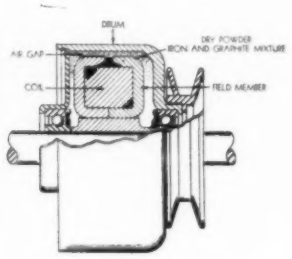

Fig. 1. Fixed air gap type.

lubricated load-transmitting bond, the strength of which depends upon the value of the exciting current applied to the magnet coil. By varying the exciting current, any condition of slip between full lock-up to full release can be obtained. When the coil is de-energized, the magnetic and lubricating particles comprising the bond immediately collapse and the members rotate freely with no viscous drag or creep induced by the mixture. This is due to the lightness of the mixture which allows it to circulate freely in the air gap. This fixed air-gap type is usually more desirable for constant slipping, modulating or retarder applications.

The drawing in Fig. 2 illustrates the variable air-gap type where one or more plates are clamped between the field member containing the coil and the shoe

(*Turn to page 88, please*)

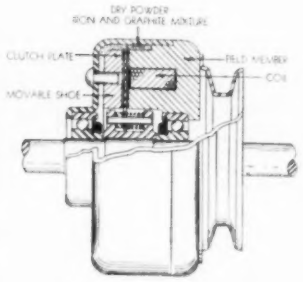

Fig. 2. Variable air gap type.

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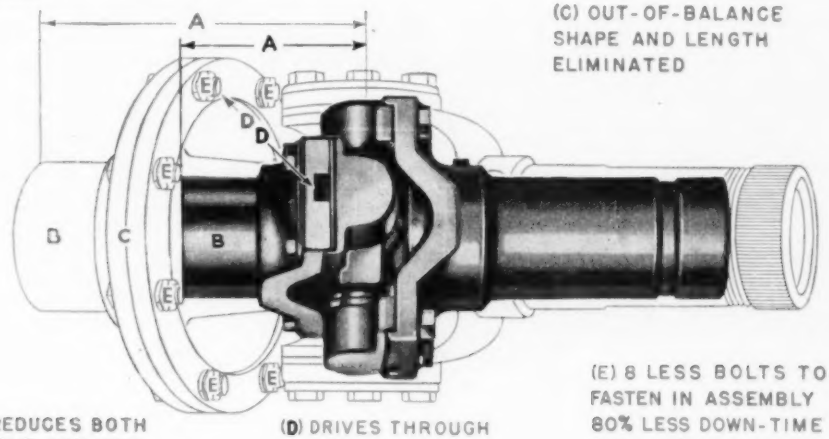

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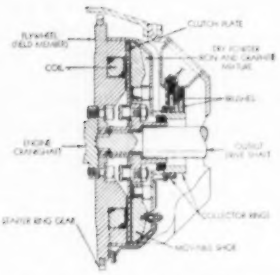


Fig. 3. Automotive clutch application.

which completes the magnetic circuit. When the coil is excited, the shoe is drawn magnetically toward the field, thus squeezing the plate or plates between the field member and the shoe. As this occurs, particles of powdered iron and graphite are trapped on the friction surfaces, thereby automatically refacing them each time the current is applied. The variable air-gap type is recommended by Eaton where smooth clutching or braking engagement and action are required with maximum capacity in minimum space. Fig. 3 illustrates an application of the variable air-gap type to an automobile clutch.

Head of Ford of Canada Pledges All-Out Defense Effort

Rhys M. Sale, president of Ford of Canada, pledged his firm to an all-out defense effort, but said so far no Canadian automobile maker had been given any military orders. Mr. Sale told a meeting of the board of directors of the National Sales Executives organization that most orders for war materials placed in Canada had gone to government-operated plants and shipyards.

"Relatively few orders are in the hands of private firms," he said. "I have no knowledge of any major order for military vehicles having been placed so far with any Canadian automotive firm." The Ford president said the automobile industry was already feeling the pinch of steel shortage applicable both to Canada and the U. S. As a result of defense stockpiling of steel, Ford of Canada could plan no further ahead than "a couple of months. Nevertheless, I doubt whether as many cars will be produced in North America in 1951 as have been built this year," he said.

Bell to Convert Leased Plant for Jet Nacelle Assembly

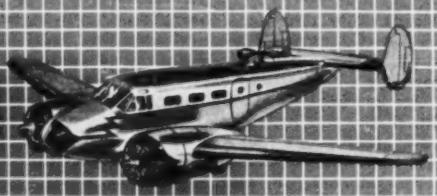
Conversion of the main assembly building at the old Globe Aircraft plant in Ft. Worth, Texas, into a jet engine-nacelle assembly factory employing approximately 400 persons will begin immediately upon final approval of a lease to Bell Aircraft Corp. of Buffalo. Lease of a 78,000-sq-ft structure by the Navy to Bell was approved by the Munitions Board in Washington, and final activating approval by the General Services Adminitration is expected.

The plant will assemble the nacelles for the twin jet-engines being installed on B-36s and B-47s, including the engines themselves, into a complete "package" ready to hang on the big bombers' wings. Consolidated Vultee Aircraft Corp. in Ft. Worth, manufacturer of the B-36 and B-36D bombers, has been securing its jet nacelle assemblies from Bell since the start of the jet-engine program.

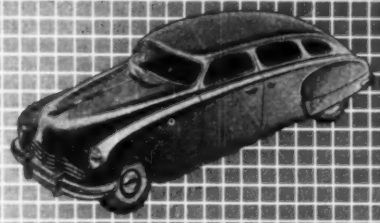
B. F. Goodrich Co.—**Earl Hensal** has been named production superintendent of tire manufacture in the Akron plant, and **William L. Carpenter** production superintendent of the company's Miami, Oklahoma, plant. **Mokal G. Morgan** has also been appointed superintendent of the tire division.

Ryan Aeronautical Co.—**L. L. Underwood**, formerly assistant treasurer, was named controller. **Dale H. Ockerman**, assistant secretary of the corporation, was elected to serve also as assistant treasurer.

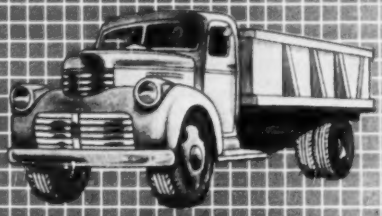
wire cloth



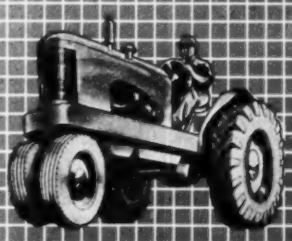
for AIRCRAFT



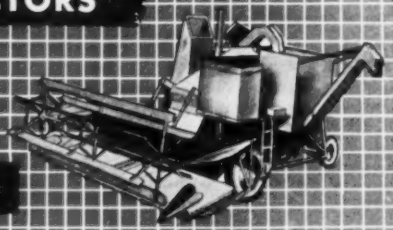
for AUTOMOBILES



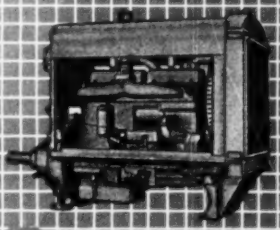
for TRUCKS



for TRACTORS



for HARVESTERS



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DIXON, ILLINOIS

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Industrial
WIRE
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WHERE ELSE CAN YOU GET ALL THIS?

For Economy • Dependability Smoothness • Long Life

It's already making a name for itself in leading makes of trucks—Continental Motors' new Red Seal T-6427. It's hauling heavier payloads, maintaining faster schedules, cutting costs by wringing the last ounce from modern fuels.

An unmatched array of quality features tells you why. Check the list below. Compare with other engines, point by point, and you'll know why the new Red Seal T-6427 is the one best choice for high-speed long-distance hauls.

Remember, too, that no matter what your specific transportation job, on or off the highway, there's a Red Seal model engineered and built to do it RIGHT.

Re-designed combustion chamber for higher compression.

New high-output camshaft, with cam contours designed to improve valve action and prolong lives of valves and springs.

New larger diameter sodium-cooled exhaust valves, stellite-faced for resistance to pitting, burning and warping.

Positive rotary exhaust valve action preventing power lows and spring damage due to carbon deposits on valve seats.

Chromium-plated top piston ring at maximum distance below top of piston for higher oil economy coupled with long life for cylinder bore and rings.

Duplex downdraft carburetion.

Automatic heat control for fast warm-up, easy starting, and economical running.

Individually inspected water passages in cooling system. Coolant is directed to hottest areas.

Full-length water jacketing, assuring water circulation completely around all cylinders, prevents distortion and makes for long service-free life.

Continental Motors' patented system of individual porting, assuring uniform distribution of fuel mixture to all cylinders, promoting complete volitilization and burning of "heavy ends" of fuel, eliminating "loading," improving thermal efficiency, and making directional influences of carburetor and air cleaner much less critical.

Water by-pass system and leakproof water pump.

Alloy-steel exhaust valve seat inserts for long trouble-free life.

Non-rusting Silchrome intake valves.

Counterbalanced alloy steel crankshaft with vibration damper; Tocco-hardened journals.

Non-corroding Durex-100 main and connecting rod bearings.

Pressure lubrication with positive-displacement oil pump; Float-O screen assures supply of cleanest oil at all times.

Built-in oil cooler and oil-filter.

Helical-teeth timing gears for silence and long life.

Tappets, bearings and crank seals removable without removing engine or transmission.

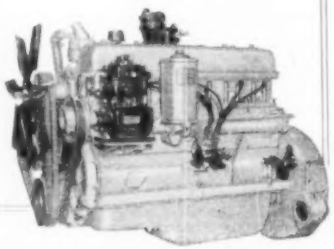
Fuel pump located on engine's cooler side, to eliminate vapor lock.

Expansion-valve type exhaust manifold.

Multi-studded cylinder head for long gasket life and freedom from head distortion.

Three-point suspension.

MODEL T-6427 *Six cylinder, overhead valve engine for trucks and buses. 126 to 145 h.p. at 2600 r.p.m.*



SERVICE EVERYWHERE

Continental Motors Corporation
MUSKEGON, MICHIGAN

Chrysler Hand Brake

(*Continued from page* 40)

lever is pivoted on one shoe and is linked to the opposite shoe by means of a push rod. The lower ends of the shoes are connected by a brake adjusting nut and stud assembly, which is also used to compensate for lining wear. Not shown on this illustration are a return spring preventing the shoes from contacting the brake drum when the brake is not in use and a positioning spring preventing fore-and-aft movement of the floating shoes.

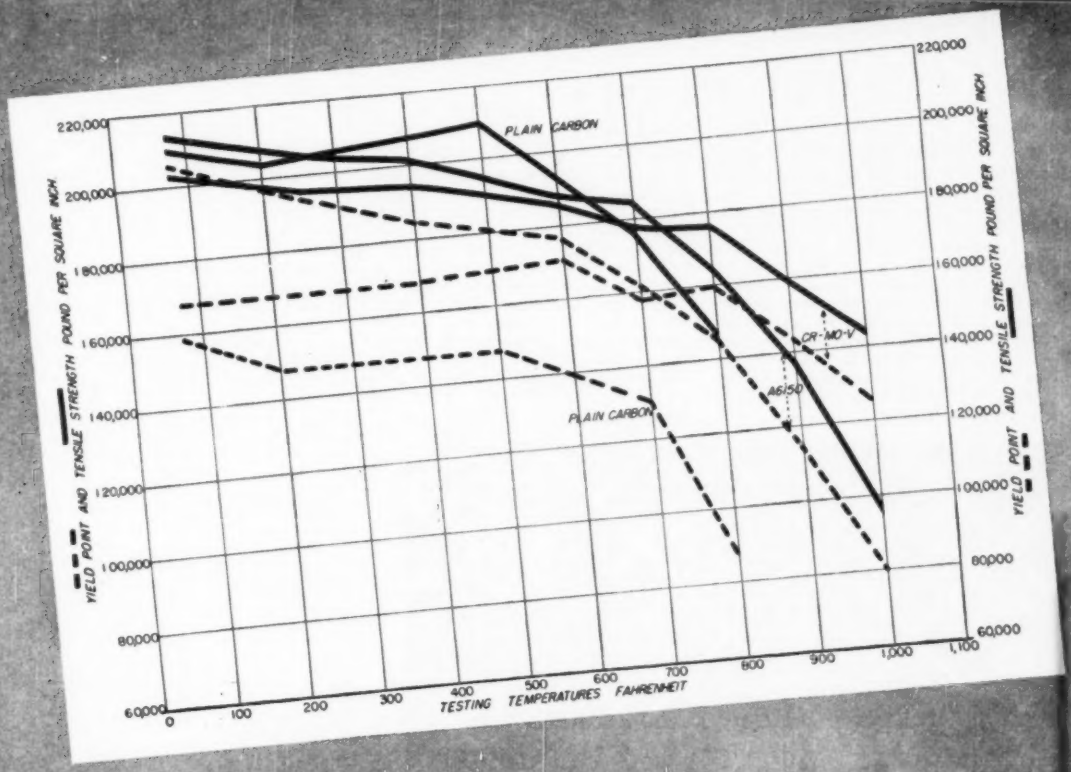
Application of a hand force on the hand brake handle pulls the lever to the left as shown in the illustration. The resultant lever force is transmitted from the lever to the push rod and through the lever pivot to the pivoted, or right, shoe. As the pivot is connected to the lever and right shoe only, the push rod forces the left shoe against the drum and the reaction force at the pivot pushes the right shoe against the drum.

During forward motion of the car, the drum tends to rotate both shoes in a counterclockwise direction as soon as the shoe linings contact the drum. The brake adjusting nut and stud assembly becomes, in effect, a fixed pivot point for the left shoe. As a result, the left shoe is forced even tighter against the drum by the rotational force and the braking force is multiplied due to this self-energization. The multiplied force is, in turn, applied to the right shoe through the brake adjusting nut and stud assembly. As the right shoe is held fixed by the anchor pin, the input to it from the left shoe is further multiplied by the self-energization effect of the right shoe. Thus, the multiplication of braking effort in the left shoe plus the added multiplication in the right shoe provides an increased braking effort.

The extra gain in braking effort due to self-energization is said to reduce by almost two-thirds the required hand pull to firmly set the hand brake.

The brake shoe support plate is fastened to the rear of the transmission extension housing while the brake drum is attached to the universal joint flange and encloses the brake shoe assembly. Therefore, the brake drum rotates around the fixed brake shoe assembly. A fully enclosed cable is used to transmit the applied hand force to the brake.

Two brake adjustments are provided. A cable conduit adjusting nut is located at the hand brake and is used to adjust cable length. The brake adjusting nut and stud assembly previously mentioned provides adjustment to compensate for lining wear.



HIGH TEMPERATURE PROPERTIES

of Cr-V and Cr-Mo-V Spring Steels

SPRINGS FOR SERVICE at elevated temperatures require steels which resist softening and lowering of the yield point. Unless hardness and yield strength are stabilized by correct alloy additions to the steel, these properties deteriorate rapidly as the temperature is raised.

The chart above shows the yield point and tensile strength of three types of spring steel at elevated temperatures determined by standard short-time tension tests.

Springs of plain carbon steel are sometimes used at moderately elevated temperatures, although their lower yield values prevent them from giving service as satisfactory as that of the alloy spring steels.

Chromium-vanadium steel springs, such as AISI 6150, give better service at ordinary temperatures because of the higher yield point. In addition, they may be used at operating temperatures up to about 700° or 750° F because they retain high yield point values as the temperature is increased.

Chromium-molybdenum-vanadium steel was especially designed for springs operating at temperatures in excess of 750° F. It can be used for springs operating at temperatures as high as 850° F or even higher under some conditions. At 800° F, the yield point of this steel is still greater than that of plain carbon steel at room temperature.

If you have a problem in spring applications at elevated temperatures, our metallurgical engineers will be glad to help you solve it.

MAKERS OF ALLOYS — VANCORAM — CHEMICALS AND METALS

VANADIUM CORPORATION OF AMERICA

420 LEXINGTON AVENUE, NEW YORK 17, N. Y. • DETROIT • CHICAGO • CLEVELAND • PITTSBURGH

1951 Pontiac

(*Continued from page 39*)

This eliminates valve flutter and resultant strain on the bellows, thus prolonging the life of the unit. This revision was put into effect during mid-season 1950 production.

Distributors for both models have been improved to provide smoother vacuum advance and greater breaker plate stability. This has been accomplished by improving the method of finishing the fixed breaker plate, providing less frictional resistance to the movement of the plastic buttons on the movable breaker plate. Breaker plate stability has been added by revision of the spring type clip which fits in a groove on the guide pin projecting through the fixed plate. The movable breaker plate now is positively positioned and rides on the polished support plate.

Starter motors have been improved through the adoption of plastic insulation for field coils, providing greater protection against water and more positive insulation for the wires.

An important feature added on the Six only is the new RPD carburetor having a concentric float bowl permitting use of dual float fuel level control. This carburetor offers the following features:

1—Unique construction permitting suspension of the main metering jet and power valve from the air horn into the float bowl.
2—Elimination of the anti-percolator vent.
3—Elimination of mechanical metering.
4—Centrally located main discharge nozzle.

Generator capacity has been increased to 40-amp as compared with 35-amp, improving output characteristics at low driving speeds.

For 1951 models cooling system pressure loading is increased to seven-psi by a suitable change in the radiator pressure cap. This raises the boiling point of coolant around 20 F.

A significant improvement in the ride on rough pavement is promised by the change in the rear suspension, using five-leaf springs with 58-in. spring eye centers as compared with the former seven-leaf, 56-in. center springs. Spring leaves of the new springs are thicker than before. In addition, the new spring suspension is of single stage, uniform-rate type whereas former practice was two-stage or variable rate. Special heavy duty 58-in. springs are available for taxi, police car, export, station wagon, and sedan delivery models.

On convertible models the top-raising mechanism has been relocated in a position under the rear compartment shelf, removing the pump and motor unit from the engine compartment. In addition, the size of the unit has been materially reduced by adoption of a reversible motor and pump assembly, operating in a completely closed system—without openings or vents. Positioning of the control lever will cause the motor to run in either desired direction, eliminating special reverse valving.

How Much Less Does an Engineered Clutch Cost?
An engineered-to-the-job ROCKFORD CLUTCH application involves recommendations covering the proper type—spring-loaded, over-center, multiple-disc, gear-tooth or splined-to-shaft drive—as well as torque rating, shock-load absorbtion, slippage control, vibration dampening and provision for frequent drive shaft reversals. Regardless of your needs, ROCKFORD CLUTCH engineers can specify a size and type clutch that will operate most efficiently in your product—conserving space, power and final cost.
ROCKFORD
Power Take-off
CLUTCHES
ROCKFORD CLUTCH DIVISION
BORG-WARNER
315 Catherine Street, Rockford, Illinois

Television

(*Continued from page 47*)

A battery of 169 presses is employed to form sheet metal parts. It is of interest to note that some of the presses have been equipped with an iron hand for reaching into the press and grasping the formed part. The presses range in capacity from 600,000 to 2,200,000 lb for the 79 major units, and 64,000 to 260,000 lb for the 90 smaller units.

Adjoining the press room there is a metal shop where 85 production machines are used for welding various stampings into assemblies and sub-assemblies.

One particularly interesting item is that television has been put to a new use at the body plant, where one of the first applications of its kind is in successful operation. The factory is equipped with a camera, a transmitter,

(*Turn to page 96, please*)

Here are American Quality Springs

in Action!

● Springs are the very heart of most toys for children. But what a beating they have to take.

Toy springs are wound to the limit, countless times a day. They're *overwound*. Even wound *backwards*. All but the best springs give mighty short service.

We make these rugged springs for many toy companies . . . and they stand up. But that's not all we do. American Steel & Wire makes springs for locomotives, alarm clocks, tractors, typewriters — everything, in fact, that needs good springs . . . well designed . . . carefully manufactured.

Take advantage of our wide experience, our unequalled research and testing facilities, our most modern production equipment. For expert engineering assistance and further information, write: American Steel & Wire Company, Rockefeller Building, Cleveland 13, Ohio.

the spring's the thing!

AMERICAN STEEL & WIRE COMPANY, GENERAL OFFICES: CLEVELAND, OHIO • COLUMBIA STEEL COMPANY, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
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USS **AMERICAN QUALITY SPRINGS**

UNITED STATES STEEL

RM helps

make the "CATS" go!

Where construction jobs call for equipment with real guts, Caterpillar Tractor Co. has always filled the bill. Now Caterpillar is starting to make new records with two husky Diesel units of 275 hp each . . . the 4-wheeled DW20 tractor and the 2-wheeled DW21 prime mover.

In every detail, these units are rugged . . . and then some! For example: the air brakes, in which two types of R/M molded brake blocks are used, are 22" in diameter and 7" wide. The constant-mesh double-plate clutch, in which R/M semi-metallic clutch facings play a vital part, is 16" in diameter. Many of the springs in these models are protected by a rubber coating applied by a highly specialized R/M process.

Why were R/M materials selected for these applications? Because R/M linings, facings, and other products . . . such as wire-inserted hose and molded rubber parts . . . have performed dependably, year in and year out, on other Caterpillar machines. R/M products serve on practically every type of unit built by the automotive and machinery industries.

For this kind of performance, and for helpful service and advice, call in your R/M representative. Behind him, at your call, are the experience and the facilities of the world's largest maker of friction materials.

RAYBESTOS-MANHATTAN, INC.

EQUIPMENT SALES DIVISION **620 Fisher Bldg., Detroit 2, Mich.**

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Factories: Bridgeport, Conn. Manheim, Pa. Passaic, N.J. No. Charleston, S.C.

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FIRST IN FRICTION

RAYBESTOS-MANHATTAN, INC., Manufacturers of Brake Linings • Brake Blocks • Clutch Facings Fan Belts • Radiator Hose • Mechanical Rubber Products • Rubber Covered Equipment • Packings Asbestos Textiles • Powdered Metal Products • Abrasive and Diamond Wheels • Bowling Balls

and two receivers which are used to expedite the loading of scrap into railroad cars. This video setup enables the operation of the scrap baler to view the gondola scrap car, located on a railroad track outside the building, at all times.

The camera is mounted on a beam extending from the southwest edge of the building roof and is focused on the discharge end of the baled-scrap conveyor. Eight 1500-watt flood lights illuminate the area at night.

Electrical signals from the camera go to the transmitter alongside the camera. These amplified signals are transmitted through coaxial cable to the receiver screen located at the baler unit deep inside the plant.

When the baled scrap is discharged from the scrap baler to the conveyor, it is carried to a chute in which it slides down into the waiting scrap car. The picture of the car-loading operation is constantly visible on the receiver screen allowing the baler operator to see when the car needs to be moved in order to fill it uniformly.

A car puller device is located at the scrap car and can be operated from the baler control station in the press pits. When a car is ready to be moved, the operator pushes a button moving the car to a new location.

There are two balers located in the press pit area and the television control operation can be worked from either of them as both are equipped with receivers and control panels.

Perhaps You Too Can Reduce Costs with a...

Lamb Electric special application MOTOR

A number of companies have found that a Lamb Electric Motor—engineered for their particular application—enabled them to reduce product costs. Other advantages:

IN THE MOTOR —

1. Reduced weight, space.
2. Exact mechanical and electrical characteristics.
3. Thorough dependability.

IN THE PRODUCT —

4. Better performance.
5. Improved eye-appeal.
6. Compactness, less weight.

Our 35 years' experience, covering practically every type of small motor-driven product, is available to help you obtain these results. *The Lamb Electric Company, Kent, Ohio.*

This small sturdy motor can be readily adapted to a wide range of industrial applications.

This motor is used extensively on such products as: industrial vacuum cleaners, agitators, sirens, and colloid mills.

They're Going into America's *Finest* Products

Lamb Electric SPECIAL APPLICATION FRACTIONAL HORSEPOWER MOTORS

CALENDAR

OF COMING SHOWS AND MEETINGS

Conventions and Meetings

SAE Annual Mfg. & Engineering Display, Detroit .....Jan. 8-12

Nat'l Assoc. Engine & Boat Mfrs. Nat'l Motor Boat Show, New York City .....Jan. 12-20

Plant Maint. Show & Conf., Cleveland .....Jan. 15-18

Soc. of Plastic Engrs., New York City .....Jan. 18-20

4th Annual Hot Rod and Motor Sports Show, Los Angeles ..Jan. 25-29

Inst. of the Aeronautical Sciences, New York City .....Jan. 29-31

Nat'l Auto. Accessory Mfrs. Assoc., New York .....Feb. 5-8

Los Angeles Motor Car Dealer Assn., 29th Automobile Show, Los Angeles .....Feb. 16-25

SAE Passenger Car Body & Materials Mtg., Detroit .....Mar. 6-8

International Auto Salon, Geneva, Switzerland .....Mar. 8-18

Amer. Soc. Tool Engrs., New York City .....Mar. 17

Western Metal Exposition and Congress, Oakland, Calif. .....Mar. 19-23

Pacific Automotive Show, Seattle Mar. 21-24

Salone Internazionale Dell Automobile, Turin, Italy .....Apr. 4-15

British Automobile and Motor Cycle Show, New York City.....Apr. 15-23

Amer. Soc. Lubricating Engrs., Phila. .....Apr. 16-18

Amer. Mgt. Assoc., Nat'l Packaging Expos., Atlantic City .....Apr. 17-20

1951 Metal Powder Show and 7th Annual Meeting of Metal Powder Assn., Cleveland, Ohio ....Apr. 25-26

Chamber of Commerce Annual Mtg. Washington, D. C. .....Apr. 30-May 2

Materials Handling Conference, Chicago .....Apr. 30-May 4

A.E.R.A. Convention, Chicago ....May 7-9

Nat'l Air Races, Cleveland Airport May 19-20

Amer. Society for Quality Control, Cleveland .....May 23-24

Third World Petroleum Congress, The Hague, Scheveningen, Holland .....May 28-June 6

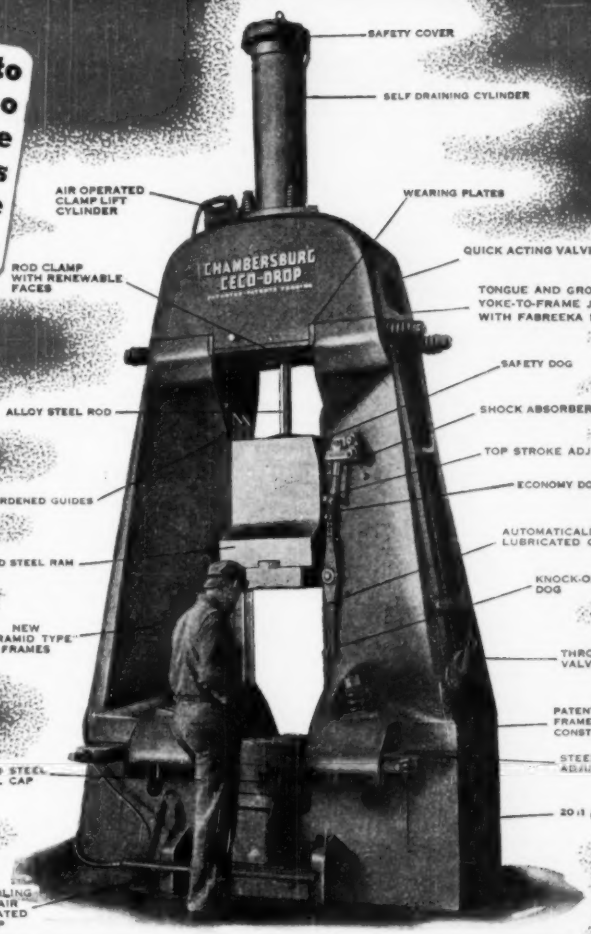
American Gear Manufacturers Assn. (Annual Meeting), Hot Springs, Va. .....June 4-6

American Society of Mechanical Engineers semi-annual meeting, Toronto, Canada .....June 11-15

American Society for Testing Mat'ls Annual Meeting, Atlantic City, N. J. .....June 18-22

You owe it to yourself to learn more about this remarkable hammer . . .

Write for Bulletin 11-L-0



CECO-DROP

• *The Boardless Gravity Drop Hammer* •

No Boards • No Front Rod • No Back Rod
Costs less to operate . . . Forges more minutes per hour . . . Is safer and easier to operate . . . This hammer is setting new records in cutting forging costs and in increasing production.

CHAMBERSBURG ENGINEERING CO., CHAMBERSBURG, PA.

precision in every thread

Slotted or Phillips head machine screws, wood screws, stove bolts, tapping screws, special headed products; nuts, rivets, chaplets, wire forms, screw machine products . . . in steel, stainless steel, copper, brass, bronze, everdur, nickel, nickel silver, monel, aluminum.

WRITE FOR catalog of complete line of Blake & Johnson fastenings. Address Dept. AI-12.

BLAKE & JOHNSON *Fastenings*

THE BLAKE & JOHNSON COMPANY, WATERVILLE 48, CONN.

Induction Hardening

(*Continued from page* 50)

root radius. Controlled hardening and quenching produces ring gears free from distortion and ready for use without straightening or further preparation. The heating operation for shrink fit serves to draw the induction hardened area. It is significant that induction hardened ring gears have many times the durability of gears hardened by the standard method of heating, quenching, and drawing of the entire gear.

Perhaps the most noteworthy setup is found in the selective hardening of eight journal areas on the rocker arm shaft for the new V-8 engine. Made of SAE-1010 steel tubing, the shaft is carburized, straightened, and completely machined in preparation for induction hardening. As illustrated, the job is handled in a 50kw Reeve Electronics Model L4J unit fitted with two power-operated, automatic cycle induction hardening fixtures. To initiate the operation, the work is fitted into the coil and mounted vertically between centers in the fixture. The cycle is arranged in two stages: In the first step four journals are hardened in half of the shaft; then the fixture indexes downward to harden the remaining four journals.

An outstanding example of the utility of selective induction hardening is found in the case of the steering knuckle pin which is made of SAE-8640 steel. Originally steering knuckle pin forgings were normalized for machining and rough machined and heat treated to a hardness of Rockwell C-38-41. The knuckle pins were then finished machined, and the journal bearing areas ground. In current practice, forgings are now heat treated to a Brinell hardness of 248-286 and machined. The bearing areas are induction hardened in a 50kw Reeve Electronics Model L5J machine at a rate of 300 an hour. Actual heating time is 5.5 seconds, producing a hardened layer 3/64 in. deep.

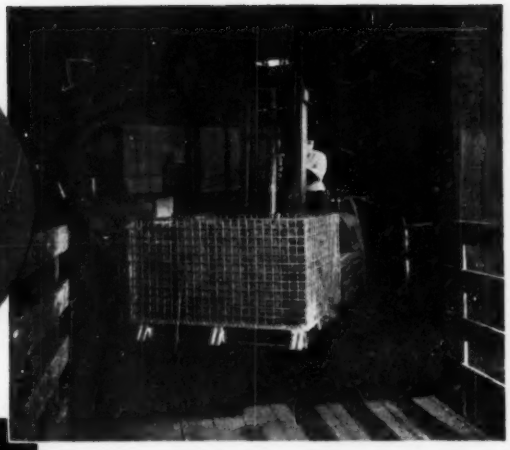
All equipment discussed, including the work handling fixtures, was furnished by Reeve Electronics, Inc., of Chicago.

Simmonds Aerocessories, Inc.—**Howard Holmes** has been appointed general manager of development engineering and sales. **G. J. McCaul** was named assistant general sales manager.

Wellman Bronze & Aluminum Co.—**Don Smith**, plant manager of the Peerless Plant, has been appointed general plant manager.

Pittsburgh CARGOTAINERS

Speed Operations and Reduce Handling Costs



Above, CARGOTAINER being loaded into delivery truck at vendors holds 345 castings—more than 2700 lbs. Previously only 88 castings weighing 704 lbs. were handled in odd size drums by one man in the same amount of time. Uniform size of CARGOTAINERS allows easy stacking after castings are loaded—also affords more efficient handling from inspection through shipping.

CARGOTAINERS in above photograph are received at assembly plant from vendor—are easily unloaded directly from truck to storage space. Note ease of stacking and minimum of storage space required, also the variety of parts that pack easily in CARGOTAINERS.

At right, CARGOTAINERS again save additional handling time and costs at end of machining process on castings. Parts are easily packed back into CARGOTAINERS and moved to storage to await final assembly. The awkward gap between vendor and assembly plant is easily bridged with versatile, maneuverable CARGOTAINERS.

For further information on Pittsburgh CARGOTAINERS, write Pittsburgh Steel Products Company, Department AI, Grant Building, Pittsburgh 30, Pa.

CARGOTAINERS by **Pittsburgh Steel Products Company**
Subsidiary of
Pittsburgh Steel Company

Welding Without Electricity

(*Continued from page 48*)

structural or esthetic considerations. To overcome these objections, the wave weld was developed. This weld is applied with the same ease as the regular straight-line weld, but it is somewhat stronger, finished work has no tendency to bend or buckle along the weld line, as a result of the wave line intersecting the grain of the metal.

Tools for making the weld are very simple, and consist of one shaped element pressing against a flat plate.

Stagger Weld

For welding thin metal sheets to heavy bar stock, such as in the construction of automobiles, truck bodies, and railroad cars, the Koldweld process makes use of a stagger weld. In the stagger weld a number of dots or short straight-line welds are slightly staggered so that they lie along two or more parallel lines. Welds are formed with a special tool applied to the sheet side of the work and, as described in the wave weld, the tools consist of a shaped element pressed against a plate.

Sandwich Weld

Various fabricators have objected to the indentations on the surface of the work produced by the application of the pressure welding tool, and the first development to overcome these objections was a new type of cold weld. With this weld the indentations appear on one side of the work while the other side remains smooth. Tests have shown the weld to be stronger than welds with indentations on both sides.

Along the same lines, a method was evolved where a third piece of metal was used to fill up the indentations—three pieces being welded together in a single operation. This proved satisfactory and eliminated the pressure tool indentations on both sides.

The ultimate development, however, was the sandwich weld where the third piece of metal is sandwiched between the two work pieces, and all three welded together in a single operation. Both sides of the weld remain smooth.

Other Applications

The Koldweld process can be used in welding heterogeneous non-ferrous metals, so frequently required in the electrical industry, Fig. 2. Commercial copper, pure electrolytic copper, beryllium copper, brass, silver, aluminum, lead, nickel, and their alloys, including monel, can be cold welded to each other.

A simple operation permits permanent welding of small or large silver and other metal contacts for switches, circuit breakers, relays, and similar items. By using a simple hand tool, it is possible to cold weld extremely thin non-ferrous metal sheets—10 mils and less.

Research is still being carried on by the General Electric Co., Ltd., and Koldweld Corp., the firm handling the U. S. market, to find even more applications and to add improvements to present methods of welding by cold pressure.

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"PLS" will facilitate production in many ways. It holds gaskets in place on oil pans, transmission pans and rear axle housings; when used on shims in the differential housing, it compensates for surface finish variations; this remarkable compound even cuts out the need for gaskets on ground surfaces of bearing plates and gear housings.

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1951 Ford

(*Continued from page 46*)

wipers are standard equipment.

A new cab, the "5-Star Extra," is optional equipment on the 1951 Ford truck fleet. It is sound-proofed with undercoating on the floor, spray-on material on the doors and back panel and with roof insulation. Roof insulation in this new cab consists of a 1½ in. thick glass wool pad cemented to the underside of the roof panel and covered with a perforated accoustic board as protection against heat and sound.

A full-width seat in the "5-Star Extra" cab is provided with a thick foam rubber pad on the cushion. It has a combination cotton and rubberized hair pad on the seat back. Its interior includes all of the refinements usually found in passenger cars.

The amazing high top with only the fringe missing, the high plate glass window that doubled as a sail if the wind was right, the willow basket, the rear entrance door . . . all contributed to the quaintness and everlasting charm of the 1904 two-cylinder Rambler.

Grandfather of the present Nash Rambler, this dignified old chariot is today considered one of the rarest and most treasured of all antique automobiles. $1350 was thought to be, in its day, a "right fair price fur such a danged purty gas buggy."

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Not surprising either, for many an early automobile was as colorful as a western sunset. Pioneer car builders used bold colors to get attention and stimulate sales.

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Studebaker V-Eight Engine Production

(*Continued from page* 36)

criteria are checked precisely by means of two large Pratt & Whitney Air-O-Limit gages, one for cam bores, the other for crank bores.

The machine line for the cylinder head is distinguished by the use of two Cincinnati tunnel type surface broaching machines, constituting a unit 100 ft long, directly connected with an extensive Footburt transfer machine line consisting of six units having 11, seven, 10, nine, four, and six stations respectively. The Footburt line alone runs some 225 ft in length. An interesting feature of the Footburt machines is that each unit handles two heads at a time in the fixture, marking an exceedingly neat problem of accurate alignment of work and machine elements.

First stage on the cylinder head line is the surface broaching of the top surface, bolt bosses, and the inlet manifold face and locating spots on the side. The broaching tool is stepped and has an angular section for side broaching. The work is then transferred into the second Cincinnati broach for surface broaching the joint face and the exhaust manifold faces on the side. Surface broaching produces an exceptionally flat surface with excellent surface finish. Work is traversed through the broaching machines at a speed of 120 fpm, removing an average of 5/32 in. of stock on each face.

The first of the Footburt transfer machines has 11 stations, combines milling and drilling operations. Station 1 is for loading; Station 2 mills front and rear ends, drills water circulating holes and dowel holes. Station 3 drills locating holes, dowel holes, and cover holes. Stations 4 and 5 are transfer stations. An interesting feature of the Studebaker head is that combustion chamber form is finish-generated by milling, this being done individually at Stations 6, 7, 9, and 10. Stations 8 and 11 are tumbling stations to clear chips.

Entering Station 1 of the second Footburt—the seven-station transfer machine—the head is loaded with angle side up, top to the left. Station 2 drills part way the bolt holes, push rod holes, and dowel holes. Station 3 handles chamfering of cover holes, drilling dowel holes, drilling bolt holes, and tap drilling. The head is again tumbled to remove chips at Station 4. Station 5 handles drilling of 31 holes. Chamfering of bolt holes and tapping water circulating holes is done at Station 6. The head is tumbled once more at Station 7 to clear chips.

The third Footburt transfer machine —10-station type—is primarily for finishing valve guide holes and spark plug holes. Work is loaded at the first station, Station 2 handling the drilling of valve guide holes, rough-facing and core-drilling valve throats. Station 3 counterbores the holes, rough-faces and core-drills valve throats. The work is tumbled at Station 4 to clear chips. Valve throats are semi-finished-bored and holes counterbored at Station 5; valve throats being semi-finished at Station 6 and spark plug holes drilled at the same station. Station 7 tumbles to remove chips. Valve guide holes are rough-reamed at Station 8; and spark plug holes counterbored. Station 9 semi-finishes valve guide holes and reams spark plug holes. Work is unloaded at Station 10, inspected, and transferred to the power conveyor to the first station of the next—nine-station—Footburt.

(*Turn to page* 104, *please*)

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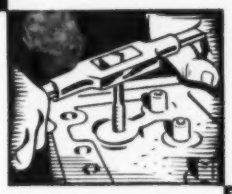

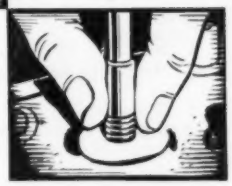

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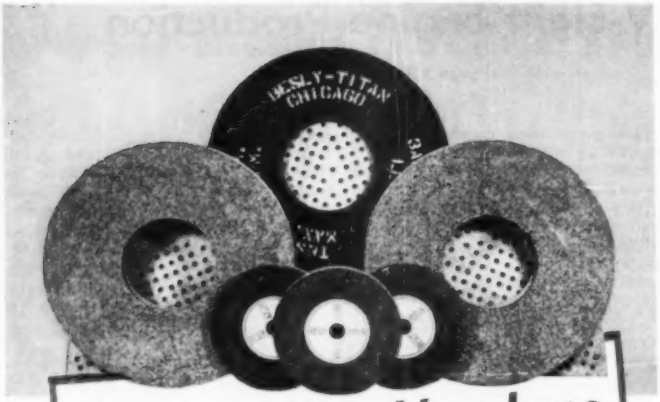

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The fourth of the Footburt transfer machines takes the work with angle side up, taps spark plug holes at Station 2. Four cover holes are tapped at Station 3. The head is then turned 12½ deg from the horizontal with bottom side up and angle side to the right at Station 4 to facilitate drilling holes for the inlet manifold, tapping for pipe tap, and drilling for the exhaust manifold at Station 5. Holes for inlet and exhaust manifolds then are chamfered at Station 6, Station 7 being idle. At Station 8 the inlet and exhaust manifold holes are tapped. Final operation is to tumble the work 21½ deg with valve guide holes vertical and angle side to the right, and unload at Station 9.

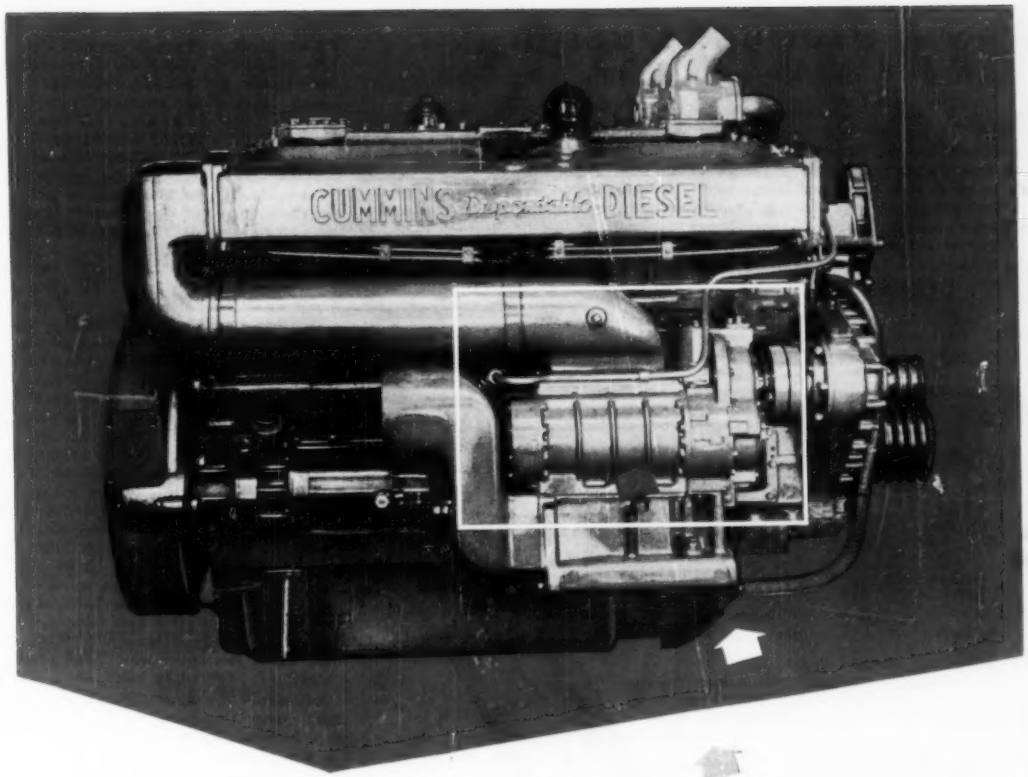
A four-station Footburt is the fifth unit in this transfer line. Loading at Station 1, the work enters Station 2 for semi-finish-ream of valve guide holes and finish-ream of valve throats. Station 3 semi-finish-faces valve seats and finish-reams valve guide holes. At Station 4 the heads are tumbled to horizontal position with top down and unloaded.

The last of the Footburt units, a six-station machine, turns the heads 90 deg at Station 1 to present the angle side to the rear with bottom side up. Station 2 then drill taps holes for the water inlet and oil hole. Station 3 drills the pipe tap hole full depth, while Station 4 is idle. Station 5 taps holes for the water inlet and oil hole, the work being ejected at Station 6.

With respect to cast iron machining on the V-8 Studebaker, it is interesting to generalize on the fact that chip handling is one of the major problems. Chip removal is so heavy and done at such fast rates as to demand special means for its disposal. In analyzing the cycle of events in the various transfer machines attention is drawn to the large number of turnover stations and tumbling stations interspersed among the work heads. Each time the block or head is turned or tumbled there is opportunity for removing most of the accumulated chips. This makes it possible to present relatively clean work to succeeding operations.

Another point of interest with respect to the management of various machine lines is found in the arrangement of cylinder block and head lines. For example, as the heads complete their course through the Footburt transfer machines they enter the assembly conveyor on which cylinder head assemblies are prepared. Similarly, the start of engine assembly is arranged directly at the end of the block machine line. Thus the washed and final inspected and graded blocks are loaded directly on the first station of the assembly conveyor. It is obvious that considerable economy in materials handling is effected by this means.

Part II of "Studebaker's Modern Equipment for V-Eight Engine Production" will appear in an early issue of AUTOMOTIVE INDUSTRIES.



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Cummins Engine Company, Inc., of Columbus, Indiana, now builds-in BW Superchargers on their new high-speed diesel, model NVHS-1200. This new engine develops 550 h.p. at 2,100 r.p.m. and weighs only *8.3* lbs. per horsepower. The naturally aspirated version, NVH-1200, with the same bore, stroke and cubic inch displacement, as the supercharged engine develops 400 h.p. at 2,100 r.p.m. and weighs *10.8* lbs. per horsepower.

For motor truck, marine, railway or general industrial applications, supercharging means savings in engine space and weight . . . means *power* to pull heavy loads . . . means sea level operation at high altitudes. All these extra benefits without corresponding increases in operating costs.

The engine manufacturer who wants to pack more power into a given engine size . . . or who wants to add an entire new series of models to his line without re-tooling or the expense of redesign, can do so simply by equipping his present line with BW Superchargers. One of our engineers will gladly explain how this can be done. There is no obligation. Write today to

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PRODUCTS DIVISION

BORG-WARNER CORPORATION

24700 NORTH MILES ROAD BEDFORD, OHIO

Product Design

(*Continued from page* 41)

carried in stock by another manufacturer. If any of these prefabricated subassemblies can be utilized, the raw material factor is included in the purchase price of a completed component.

Through good "imagineering," some way to take advantage of these low-cost items can usually be found. The three remaining factors worthy of consideration during the design stages of a product are all direct functions of the particular fabricating process used. Of the various processes available, the electric-furnace brazing process reaches its forte when ferrous materials are utilized in a design lending itself to a mass-production technique. Unfortunately, there are no set rules as to when the process can be used to advantage over another method of metal product fabrication, but a thorough investigation of the process should be made in any case where it is suspected that prefabricated parts can be assembled into a unit by any metal joining process.

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The items shown in Fig. 1 indicate the broad range of products which have been adapted to this process, enabling many severe production problems to be solved. The items connected by the counter-clockwise line are: 1. A butane tank, used for a variety of purposes including house trailer heating. Although not originally designed for electric-furnace brazing, the uniformity of joint and the low cost of production is causing a trend toward this process in pressure container manufacturing. 2. A self-oiling, leak-proof industrial hand truck wheel which is made from two stampings, a tire, and a screw-machine part. This standard item costs less to assemble and braze than the hub which is used. 3. Standard flanged hose fittings for aircraft. 4. Steel wool bearings for aircraft landing gear assemblies. 5. A laminated, special-purpose wrench made up from a series of identical stampings. 6. A special aircraft part. 7. An oil-cell sump for amphibious aircraft. 8. A hand-held fire extinguisher body. 9. A reciprocating pump shock absorber with all necessary fittings brazed into it in one operation. 10. An accumulator. 11. Hydraulic pump assembly, brazed with a silver alloy (joints shown in section). 12. An air cylinder for a rivet gun (shown in section) made from tubing and stampings. 13. A can spout which was previously soft-soldered by hand.

It can be seen from an analysis of these items that raw material costs were held to a minimum, the cost of labor in fabrication, assembly, and finishing was low because specialists were performing the various operations, appearance was improved because of the scale-free and rust-proof joints with neat fillets, and the useful life of all the items was increased because of the strength of the alloyed joints. Furthermore, the problem of maximum and minimum production requirements was solved, small lots were inexpensive to fabricate, and no capital expenditure for machinery was required for increased production except in those cases where the parent factory could not produce enough metal parts on a 24-hr schedule to keep up with sales.

The electric-furnace copper brazing method of assembly is invaluable for pressure vessels because of uniformity of joints and the resulting low cost of inspection procedure. Furthermore in any instance where fittings or other accessories are required in addition to the main assembly, no additional furnace time is needed other than that required for the initial brazed joint. The additional cost involved in producing a multiplicity of joints instead of the initial one consists of only the labor and materials involved in placing a copper wire ring at each joint. The neutral atmosphere maintained within the furnace chamber prevents oxidation at the elevated temperature and permits inspection and painting (or plating) immediately after the brazing cycle is

(*Turn to page* 108, *please*)

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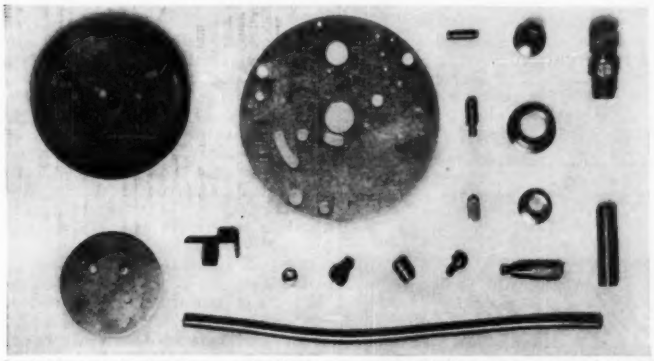


Leaded brasses, phosphor, bronze, yellow brass, copper strip and tubing used in governor for trucks, automobiles and buses—Courtesy Speedmaster Corporation, Plainville, Conn.

Brass and Bronze Important in Vehicle Speed Governors

Controlling the speed of trucks, automobiles and buses for maximum efficiency and greater safety is accomplished through the use of automatic governors.

Brass, phosphor bronze and copper strip and tube play an important part in the Speed Master governor illustrated above.

When a predetermined speed is reached, the unit automatically takes over and controls the amount of gas being fed into the engine.

Copper Conductor Shell Used

Driven off the speedometer cable, a permanent magnet spins inside a copper shell which has a steel band around it. The copper acts as a conductor for the magnetic field. The faster the magnet revolves, the more pull or "drag" is put on the floating steel shell. This shell gradually rotates, moving a series of brass levers. When the speed to which the unit is set is reached, a switch is actuated by the levers and is closed. The current is then transmitted to the carburetor unit which automatically controls the flow of gasoline.

The non-magnetic properties of the copper-base alloys play an important part in the unit. At the same time fabrication is facilitated through the use of free machining brass rod for the screw machine parts and leaded clock brass for the levers and plates which are pierced and blanked.

Piercing Facilitated

Clock brass alloy 62 contains 2% lead. This lead causes the metal to pierce cleanly with a minimum of burr. Thin sections are possible since this metal is normally supplied in hard to extra hard tempers. Tensile strengths above 70,000 psi are reached. Machining operations are also simplified by the lead content. Good bearing surfaces are also characteristic of this alloy.

Springs on the terminals are of phosphor bronze Grade A (95% copper and 5% tin). The high fatigue resistance of this alloy permits many thousands of flexings without failure.

This same unit can be modified to shut off an idling motor at any specified time on such vehicles as delivery wagons. Copper wire, brass and phosphor bronze are also used in this mechanism.

Corrosion Resistance Important

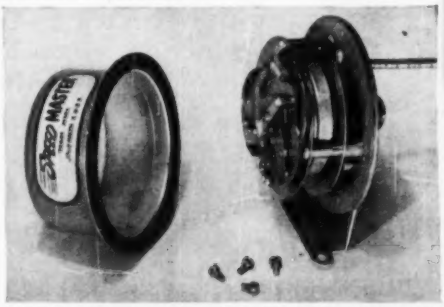
Although sealed with a rubber gasket, the conditions under which the unit operates can be conducive to corrosion of non-ferrous metals. The high corrosion resistance of the copper-base alloys also helps to insure long, trouble-free life.

High brass (65% copper and 35% zinc) is used for the mounting and assembly screws. The high ductility of this alloy lends itself to relatively easy cold heading and roll threading.

Standard Tooling Satisfactory

On the screw machine parts such as bushings and collars, free turning brass rod, hard temper (61% copper, 3.4% lead and remainder zinc) high speeds and heavy feeds are possible. The chip breaks cleanly due to the lead and high finishes are possible with standard tooling.

For information on copper-base alloys or for help in selecting the correct alloy for your product, Bridgeport's Laboratory is backed by years of experience and ready to be of service to you.



Actuating mechanism for Speed Master governor which controls speed of vehicles to a predetermined rate—Courtesy Speedmaster Corporation, Plainville, Conn.

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finished without removal of flux or scale. In many cases, pressure vessels joined by this method will fail under a bursting pressure at the ends of the tank but very seldom in the joint area.

Plant facilities for electric furnace brazing are shown in Fig. 2. The roller-hearth type furnace at the left is used for high volume production. It is powered by 320 kw capacity alloy ribbon resistor units divided into three separately controlled temperature zones in the 17-ft long heating chamber. Production rates in excess of one ton of parts per hour can be fabricated if the parts do not include heavy sections requiring slow heating. Automatic charging features include dual photo-electric relays which operate the charging door, a gas flame-curtain, and a high-speed run-in mechanism which is separately motor-driven through overrunning sprockets inter-connected with the main furnace drive. Furnace rolls, spaced on 10 in. centers throughout the entrance, heating, cooling and discharge chambers for a distance of approximately 101 ft, are each separately driven through individual sprockets actuated by a roller chain which is powered by the main drive. The discharge door and high-speed run-out mechanisms are actuated automatically by a flag switch which makes contact with a tray-load of the slowly cooled parts. The roller hearth type furnace at the left in Fig. 3 is used for development work and special annealing or brazing requirements. In this machine, the 9-ft heating chamber contains 88 kw of alloy ribbon resistor heating units divided into two separately controlled heating zones. Charging and discharging are manual. Both furnaces are suitable for stainless and miscellaneous steel annealing, normalizing, silver brazing and other heating operations. A non-decarburizing protective atmosphere is readily available for either furnace, as desired. Many safety and protective features are incorporated to minimize any possibility of loss of production due to maintenance and repairs.

To realize maximum benefits from designs planned for the electric-furnace brazing process, it is necessary to study a few basic principles: Select the strongest materials available at the least cost; use press fits if possible—if parts consist of aluminum, brass, or certain stainless steels, a silver alloy may be recommended, in which case a sliding to loose fit should be used; parts should be degreased before assembly; parts can be heat-treated in most cases—when copper is used in the joint, an iron alloy is formed which has a higher melting point and greater strength than the copper used to infiltrate the joint area; use lapped joints with large areas.

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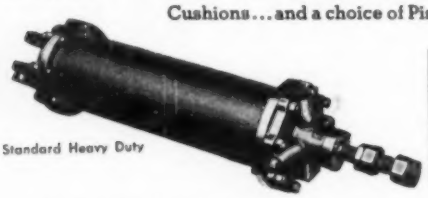

Standard Heavy Duty

For further information and data on NOPAK Cylinders and Valves, refer to Sweet's File for Product Designers, or write for Bulletin SW-1.

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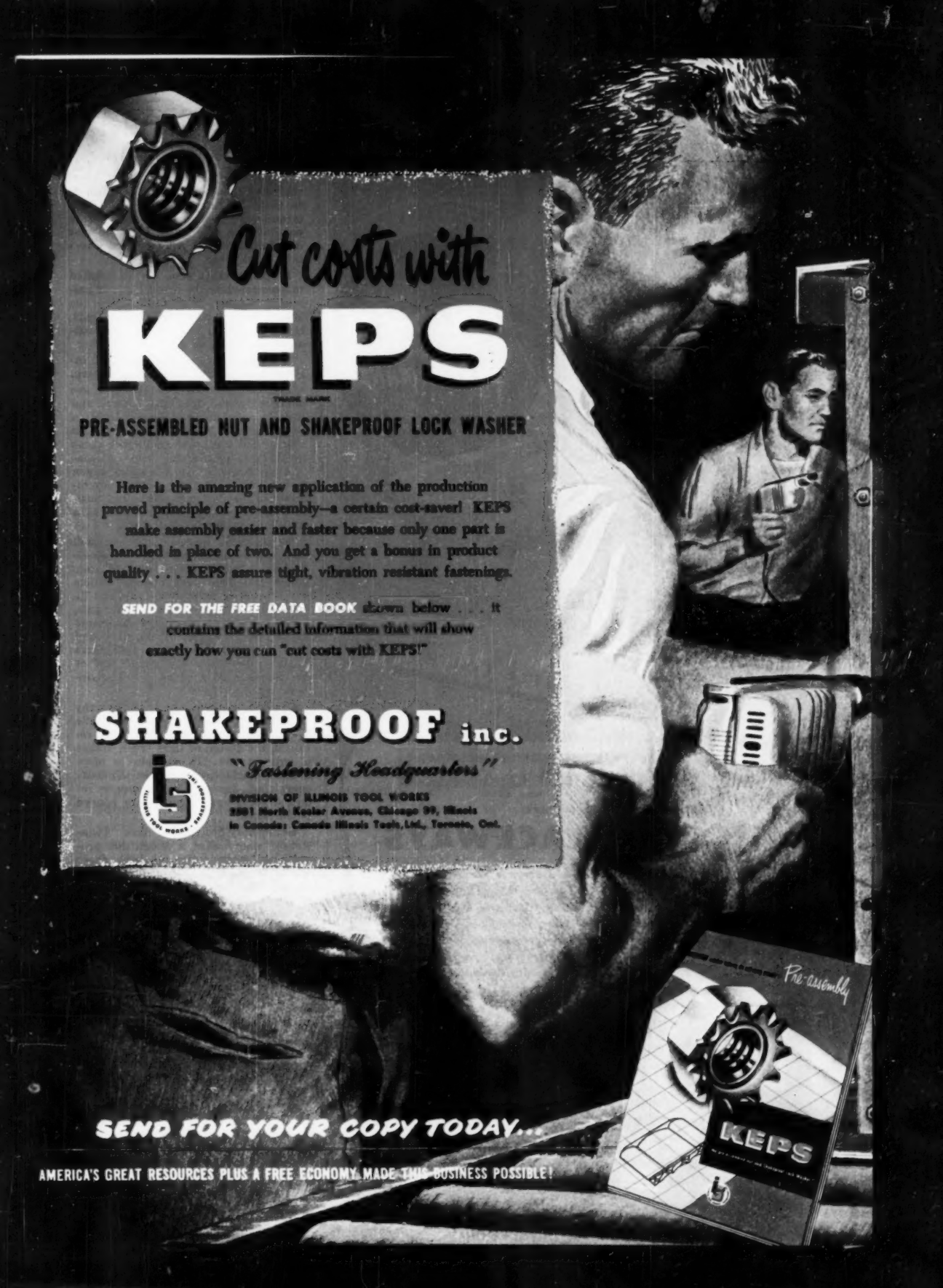
BOOKS . . .

PROBLEM LAYOUTS FOR TECHNICAL DESCRIPTIVE GEOMETRY, by *B. Leighton Wellman*, published by *McGraw-Hill Book Co.*, New York, N. Y. Price $2.75. Problems presented in this book have been especially prepared for use with the text "Technical Descriptive Geometry" by the same author. The problem sheets provide, together with the text, a complete and well-balanced course in descriptive geometry.

A MANUAL OF PLASTICS AND RESINS, edited by *William Schack*, published by *Chemical Publishing Co., Inc.*, 26 Court Street, Brooklyn 2, N. Y. Price $10.00. A comprehensive but compact survey of the materials, processes, products and equipment of the plastics industry. The book contains some 1500 subjects arranged in alphabetical order. Major fields of plastics applications, such as aircraft, automotive, electrical appliances, etc., are discussed in detail. Each article tabulates not only the components for which plastics are used, but also the specific plastic used for each, and the properties which make it suitable for the purpose.

INTERNAL COMBUSTION ENGINES, Second Edition, by *Edward F. Obert*, published by *International Textbook Co.*, Scranton, Pa. Price $7.50. Containing essential information on Diesel and gasoline engines for automotive, train, and airplane duties, this second edition offers increased coverage of gas turbines, dual fuel engines, gas Diesels, fuels, lubricants, and additives. The basic principles along with engine construction and operation are thoroughly described. A great number of charts, tables and illustrations are provided along with numerous completely-worked examples and a large number of problems for solution.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Engineering and purchasing executives are invited to write for the Hoover Engineering Manual.
THE ARISTOCRAT
OF BEARINGS
HOOVER BALL and BEARING CO.
Ann Arbor, Michigan

1951 Chevrolet

(*Continued from page 37*)

the same as previously. The effect is to raise the frequency of maximum torque tube vibration and eliminate the possibility of a vibration harmony that occasionally causes roughness in a certain speed range.

Propeller shaft ends are redesigned to accommodate the attachment of balancing weights. In manufacturing, the entire assembly of propeller shaft, bearings, pinion and pin, are now balanced within ¼ oz-in.

Steering gear ratio has been increased to reduce effort when parking.

Fourteen passenger body types are included in the 1951 line. Two- and four-door sedans will be available in Styleline and Fleetline series. All sedans and the sport coupe will come in De Luxe or Special trim. A convertible coupe, all-steel station wagon and the Chevrolet Bel Air are exclusively in the De Luxe series. The business coupe will be available only as a model in the Special series.

In its 1951 models Chevrolet will make available trucks in 10 wheelbases, including the 179-in. chassis added late this year. Gross vehicle weights range from 4000 to 16,000 lb. Through changes in the front axle, springs and tire sizes, the maximum gross vehicle weight of the 4100 and 4400 series has been raised from 12,500 to 14,000 lb. Minimum GVW of the Series 6100 to 6400 has likewise been upped to 14,000 lb.

Braking improvement is noteworthy on light- and heavy-duty trucks. While the hydraulic principle has been retained, the design of light truck brakes is entirely new. In addition to more braking surface, the brakes are self-energizing. Less pedal pressure is required for stops. Linings are bonded to the shoes.

Heavy-duty trucks now have "Twin-Action" rear brakes, a design that provides self-energization of both shoes whether traveling forward or backward. As illustrated, each brake assembly is equipped with two cylinders —each operating on the two shoes— and four anchors. Primary or sliding pivot anchors come into action during braking in forward motion; the secondary or adjustable anchors when braking in reverse. When brake pressure is applied, the shoes tend to move away from the anchors and contact the drums. As soon as this contact takes place, friction force tends to move each shoe in the direction of rotation, forcing it against its anchors and inducing self-energization. The two shoes are equally and independently self-energizing.

As a year ago, Chevrolet will make available two engines, the Loadmaster of 105 hp and the Thriftmaster which develops 92 hp.

Will the *Millionth* be like the *First*?

Will it . . . the millionth part or product produced? Will it be exactly like the first, in quality and performance? We've spent a great many years, and a great many million dollars, in accomplishing that result. And we do it. That's why we're asked to solve so many design and production problems for the automotive and aviation industries. It goes this way . . .

Designers bend over drafting boards, pace the floor, and bend to draw again . . . in evolving an idea for something that will do a certain job perfectly. And often their pondering combines saleable beauty with functional excellence.

With these designs in hand, Inland engineers produce a functional model. Though the product desired may be quite simple, they may and often do combine the metallurgical, physical and chemical sciences in combining metals, rubber, plastics, frictional and other materials.

Testing of the functional model is exhaustive, under both laboratory conditions and the far more severe and varied ones encountered in actual service.

Most important, perhaps, the entire production process is under constant and rigid laboratory control, with the result that each part or product is precisely like the original design in specifications and performance.

Then . . . quality in quantity. Research, design, engineering and laboratory control of production combine in enabling Inland to produce the thousandth, or millionth, or ten millionth part or product, or any unit chosen at random, so that it will deliver the same very high standard in customer satisfaction.

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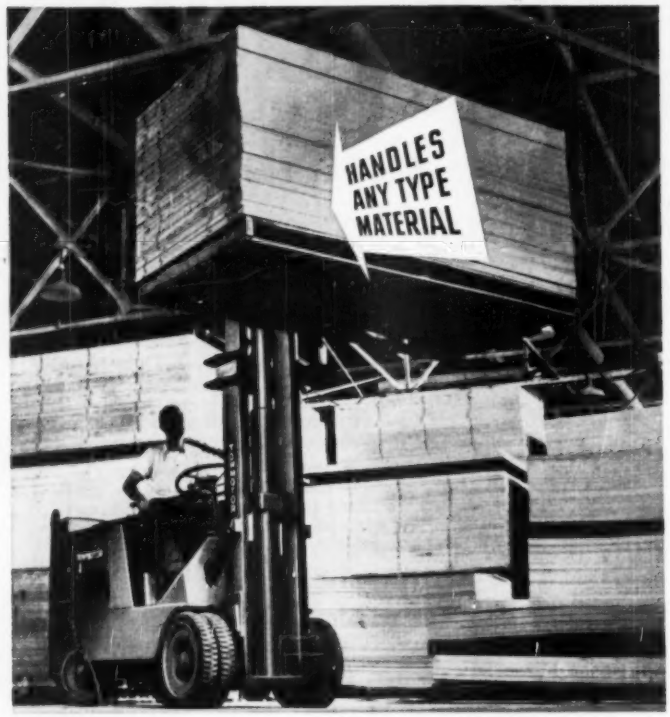

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Mass Handling is the answer!

RECEIVING • PROCESSING • STORAGE • DISTRIBUTION

Problems of Engine Operation

(*Continued from page* 45)

Shapes of the curves for the regenerative and regenerative-plus-reheat engines are approximately the same; however, the fuel consumption of the regenerative-plus-reheat engine is slightly lower for the range of compressor pressure ratio at both altitudes. The pressure ratio, however, for minimum specific fuel consumption is greater than that of the regenerative engine. Regeneration plus reheat gives a decrease in minimum specific fuel consumption of approximately two per cent at sea level from that of the reheat engine, six per cent from that of the regenerative engine, and 10 per cent from that of the basic engine. At 30,000 ft, the decreases in minimum specific fuel consumption are approximately four, five, and seven per cent for the reheat, regenerative, and basic engines, respectively. Compressor pressure ratios for minimum specific fuel

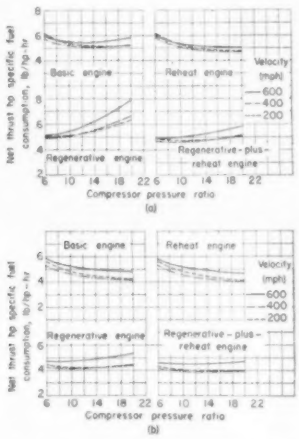


Fig. 6—Net thrust horsepower specific fuel consumption is plotted against compressor pressure ratio for each of the four types of engines at an altitude of sea level, graph (a), and 30,000 ft, graph (b).

consumption for the regenerative-plus-reheat engine are eight at sea level, and 12 at an altitude of 30,000 ft. These compressor pressure ratios are lower than those for both the reheat and the basic engines, and slightly higher than those for the regenerative engine at both altitudes.

Specific fuel consumption generally decreases as flight speed is increased from 200 to about 400 mph, and then increases as the flight speed is increased from 400 to 600 mph.

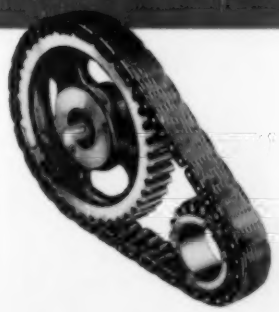
(*Turn to page* 116, *please*)

Forty-nine million examples of leadership! That's why—

M=TC

Morse *means* Timing Chains

In the last thirty-six years, 116 makes of passenger-car and truck engines have been equipped with more than 49,000,000 Morse Timing Chains. *That's* why Morse is *the* leading manufacturer of automotive timing chains.



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Effect of turbine-inlet temperature on specific fuel consumption is shown in Fig. 7, where minimum net thrust horsepower specific fuel consumption is plotted against turbine-inlet temperature for the basic, reheat, regenerative, and regenerative-plus-reheat engines. Curves are shown for a flight speed of 500 and 600 mph for an altitude of 30,000 ft.

At a flight speed of 500 mph, a decrease in minimum specific fuel consumption of about 12 per cent is obtained for the basic engine by increasing the turbine-inlet temperature from 2000 to 2500 R. This decrease in fuel consumption with temperature is accompanied by an increase in compressor pressure ratio from 20 to 38.

Slightly lower specific fuel consumptions are indicated for the reheat engine at all conditions, and the compressor pressure artios, for minimum specific fuel consumption for this engine are considerably higher than those required by the basic engine. Similar curves are presented for both regenerative and regenerative-plus-reheat engines. Improvement in minimum specific fuel consumption for the regenerative engine is about 10 per cent in going from a temperature of 2000 to 2500 R, and approximately the same improvement is indicated for the regenerative-plus-reheat engine. The required compressor pressure ratios for both the regenerative and the regenerative-plus-reheat engines are considerably lower than those required by the basic and the reheat engines. Almost identical results can be drawn for the same conditions at a flight speed of 600 mph.

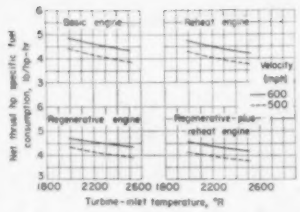


Fig. 7—Effect of turbine inlet temperature on specific fuel consumption at an altitude of 30,000 ft.

Increasing the turbine-inlet temperature from 2000 to 2500 R, increased the maximum power per unit frontal area about 60 per cent for all engines. Increasing the turbine-inlet temperature, increases the net power per pound engine weight, at compressor pressure ratios corresponding to maximum power per unit engine frontal area, about 25 to 30 per cent for all engines.

Accessibility for Maintenance Cars and Trucks

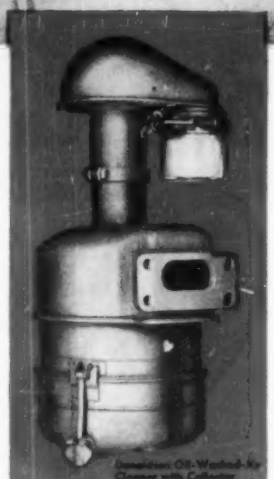
By H. O. MATHEWS
Manager of Transportation
Standard Brands Inc.

In order to determine what improvements had been made in automobile design, an analysis of the flat rate time allowed for certain operations on vehicles of the prewar design compared to those of the new designs manufactured in 1948 or '49 was made. Two of the manufacturers of small vehicles very kindly consented to furnish information which I believe will be of value in considering this problem. Table 1 shows

(*Turn to page* 118, *please*)

Table 1—Maintenance operations of car A given in hours

	1941 Pass.	1949-50 Pass.
Front shock absorbers—refill	.5	Sealed Unit
Rear shock absorbers—refill	1.0	Sealed Unit
Brakes—complete adjustment	2.0	1.2
Brake shoes—(4 wheels)—replace	2.0	2.5
Brake main cylinder—overall	2.0	2.1
Engine tune-up—minor	1.5	1.7
Engine tune-up—major	2.4	3.0
Connecting rod bearings—adjust	2.9	2.9
Piston rings—replace	7.9	8.1
Pistons and rings—replace	8.0	9.6
Engine overhaul (in chassis)	16.3	15.1
Engine overhaul (major)	27.0	27.3
Radiator hose—replace	.4	.4
Clutch assembly—overhaul	3.5	3.3



Under dust conditions like those in which this crawler tractor is working, any leak in the air cleaner would let in enough dust to ruin the engine.

But that big, powerful Diesel engine is protected by a Donaldson Oil-Washed-Air Cleaner and all Donaldson Cleaners are 100% sealed, with each seam and joint air tight. As a final positive check against leaks, each model cleaner is pressure tested under water. In a Donaldson cleaner, *sealing is unlimited*, leaks are completely excluded. Air can be taken into the air cleaner only through the turbulent, double-scrubbing, oil-impinging action in the air cleaner, where better than 99.44/100% of all dust is removed.

A dust concentration like that shown above, is only one of the unusual conditions that Donaldson Air Cleaners will handle. If you want assurance that your engine will be fully protected at all times, write our engineering department.

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The CRANKSHAFT is probably the most important single part in the modern high-speed, high-compression, internal-combustion engine.

Wyman-Gordon—specialists in the design and forging of crankshafts since the start of the automotive industry—furnished the first heat-treated crankshaft, forged the first six-throw crankshaft, forged the first eight-throw crankshaft, forged the first crankshaft with integral counterweights. In automotive crankshafts and in all types of aircraft forgings, steel and light alloy, there is no substitute for Wyman-Gordon experience.

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Stock Removal	VALVE STEM Finish Grind .004"-.006" in 2 passes	VALVE FACE Rough Gr. .006"-.008" Finish Gr. .004"-.006" in 2 passes	VALVE STEM Finish Grind .004"-.006" in 1 pass	VALVE FACE Rough and Finish Grind in 1 pass .014"
Average Production per Wheel Dressing	350-400pcs.	300-350pcs.	2000pcs.	1200pcs.
Total Life of Wheels	Maximum of One Week		Eight Weeks	
Grinding Fluid Cost on Machine	About $.02 per gallon		$.66 per gallon*	

*This figure does not take into consideration the reclaiming of straight oils which usually reduce the cost at least 80%.

Price per gallon is not the measure of a cutting fluid. The right oil for the job is the one that produces the best results. In this instance, it is obvious that the application of an inexpensive soluble oil was incorrect for the job and the application of a more expensive grinding oil was 100% right. Ask to have a Stuart sales engineer show you how the right oil for the job can improve your efficiency. Write for the latest literature on cutting fluids.

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the comparison of the flat rate charges made by dealers in time for the various operations selected. Since the basic mechanical design has not been changed on this particular make, it must be assumed that the changes in time required for the complete operation shown result from either a greater or less accessibility to the part to be repaired. For example, a replacement of piston-rings on the 1941 model requires 7.9 hr while 8.1 hr is required on the 1949 model. The replacement of both pistons and rings has increased from eight to 9.6 hr. Replacement of brake shoes and overhaul of the brake master cylinder also indicates an increase. There are, however, a few decreases such as, a complete brake adjustment, clutch assembly overhaul, engine overhaul, etc.

The same items were considered by another manufacturer shown in Table 2. It is to be noted that there is a general decrease in the flat rate time allowed in most of these items, and a careful examination of the vehicles would indicate that such should be the case. Since the labor rates for all these items were increased approximately $1.00 per hr during the period of the comparison, any increase in time would seriously effect the operating cost of the vehicle. There is no doubt that there has been some improvement in the quality of particular items whereby the frequency of the operations might be reduced, but since some of these operations are on a routine basis in connection with any preventive maintenance schedule, a decrease in time required is of utmost importance to the operator.

Considering the urgent need for improvement in accessibility whenever designs are being changed, I would like to suggest that a committee to make accessibility studies and recommendations be organized as a part of the Transportation and Maintenance Activity of the Society. Such a committee should consist of operators who have expressed interest in the subject and who would

(*Turn to page* 120, *please*)

Table 2—Maintenance operations of car B given in hours

	1941 Pass.	1950 Pass.
Front shock absorbers—refill	1.0	*
Rear shock absorbers—refill	.9	*
Brakes—complete adjustment	2.0	1.5
Brakes shoe (4 wheels)—replace	3.1	2.7
Brake master cylinder—overhaul	2.1	1.2
Engine tune-up—minor	.9	.9
Engine tune-up—major	1.7	1.7
Connecting rod bearings—replace	3.1	3.1
Piston rings (all pistons)—replace	6.2	5.1
Piston assemblies and rings (all pistons, replace)	7.1	7.1
Engine overhaul (major)	27.5	25.5
Radiator hoses (all)—replace	.6	.9
Clutch assembly—overhaul	3.6	3.5

* Not listed as an operation

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Big savings for customers are the order of the day . . . and more and more of these savings are resulting from Mallory contact recommendations.

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That's value beyond expectations!

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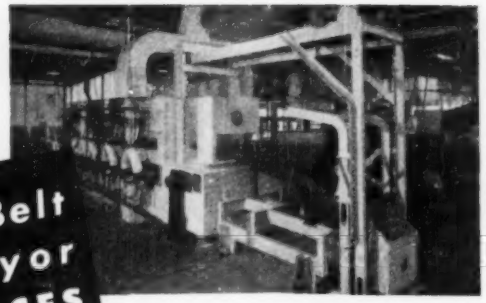

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This WISCONSIN HEAVY-DUTY *Air-Cooled* ENGINE Mounts on the Steering Wheel!

Moving 4000 lbs. at a snail's pace or up to 8 mph. and maneuvering into any corner the truck will fit . . . all at a cost of one gallon of gas per 8 hour shift is the record of this Wisconsin-powered Hyster Salsbury Turret Truck, made by The Hyster Co., Portland, Ore.

New and unusual industrial service units are being introduced by manufacturers every day, to which Wisconsin Engines are assigned as the logical power choice. Wisconsin Engine features such as snug compactness, light weight, heavy-duty construction, tapered roller bearings at both ends of the crankshaft, fool-proof air-cooling at all seasons, and an easily serviced OUTSIDE magneto, with impulse coupling for quick starting . . . combine to give Wisconsin Engines preferential ratings as power components on a great variety of original equipment in many fields.

4-cycle, single-cylinder, two-cylinder, and V-type 4-cylinder types, 3 to 30 hp. Your inquiry is invited.

WISCONSIN MOTOR CORPORATION
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be willing to contribute some of their time to the problem. The committee would be purely advisory and its service would be available to any manufacturer. It would not be used to evaluate the new designs after they have been marketed. The service manager or some similar representative from the manufacturer involved would function with the committee during studies of a particular vehicle.

Winterization of Construction Equipment

By R. W. BEAL
Engineer Center and Fort Belvoir

IN its simplest terms the criteria for winterization of military equipment requires that ultimately every piece of equipment must be inherently capable of starting and operating under temperature conditions down to —40 F but that kits may be provided in the temperature range from —40 F to —65 F. By inherently is meant built into or designed into and mounted onto the basic unit, as contrasted to a separate kit for temporary use during cold weather.

Nature itself of course imposes a criteria in terms of fluctuating and extremely low temperatures, adverse terrain conditions, snow and ice, long hours of darkness, etc.

Although —40 F is a low temperature in which to operate equipment designed for operation in temperate climates, the problem of meeting this temperature condition is not unduly severe. However, as the temperature drops from —40 F to —65 F, many and extensive changes occur in some of the materials and items of primary importance to the operation of equipment. Lubricating oils and batteries are two examples. A third example is the coolant or anti-freeze necessary in liquid-cooled engines. Although mixtures which will remain fluid at these low temperatures are available, most of them are extremely unstable when subjected to sudden changes in temperature such as occur when the coolant is used as a means of transmitting heat from a heat source to an engine.

Another factor closely tied in with operation of equipment under cold weather conditions is that of the effect of these temperatures on personnel. Operation in cold temperatures has brought into common use a new term known as "windchill factor." Briefly, this factor is a measure of the rate at which a warm body gives up heat under various combinations of temperature and wind velocity. For example, at a temperature of —35 F with a 45-mph wind, a person gets just as cold as he would at —35 F if the wind were only about 1-½mph. At any windchill above about 1400 flesh will freeze in a few

(*Turn to page* 122, *please*)

Rear-dump truck built by Euclid Road Machinery Co. The 22-ton-capacity body has Mayari R sides and bottom base plates.

Mayari R sides and bottoms for 22-ton payloads

Easy targets for loading with large shovels and draglines, the broad bodies of these rear-dump Euclids must withstand harsh punishment from loads of earth and rock weighing up to 44,000 lbs.

The sides and liner plates for the bottoms of these bodies are made from ⅜-in. Mayari R low-alloy, high-strength steel. Mayari R was selected because it has greater resistance to impact, battering, denting, abrasion, and atmospheric corrosion than carbon steel of equal gage. The builders have found that Mayari R gives extra service far outweighing its slight added cost, service that contractors appreciate in heavy-duty equipment.

Builders of many types of trucks and trailers use Mayari R because of its superior properties. Sometimes they use it in the ordinary gages to increase strength and service life of vehicles, sometimes in thinner sections to reduce deadweight. Whatever the design problem may be, it can often be solved at low cost by the correct use of this weight-saving, corrosion-resisting steel.

Ask any of our sales offices for further information on Mayari R applications in the automotive industry. Or write or phone for a copy of Catalog No. 259.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
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BETHLEHEM STEEL

Mayari R *makes it lighter... stronger... longer lasting*

Help Lower Unit Production Cost to Meet Competition *Profitably . . .*

Simplified screw driving, bolt setting and nut running mean lower unit cost. This is possible with Pheoll products because they are inspected through all manufacturing steps from coil wire or bar stock to the finished product.

All threads, whether rolled or cut, are carefully gauged to American Standards. Screw and bolt heads are formed, slotted or recessed to meet rigid engineering requirements. Overall quality of the finished product is uniformly high. Precision head formation on all bolts as well as engineered slots and recesses in all screws means less wrench and driver slippage.

Pheoll engineers will recommend the correct type, size and finish of standard or special screws, bolts and nuts for your needs.

WHAT PHEOLL INDUSTRIAL FASTENERS MEAN TO YOU	CHECK THESE PHEOLL PRODUCTS FOR YOUR NEEDS
• Simpler and speedier assemblies. • Less worker fatigue — more units. • Improved product appearance. • Added latitude in product design. • Immediate and dependable source for standardized, interchangeable screws, bolts and nuts especially suited to mass production.	☐ Machine Screws ☐ Sems ☐ Tapping Screws ☐ Square Head Set Screws ☐ Threaded Cutting Screws ☐ Cap Screws ☐ Phillips Recessed Head Screws ☐ Machine Bolts ☐ Wing Nuts ☐ Knurled Nuts

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seconds if exposed to the wind. It may be interesting to note that during the past winter at Fort Churchill, Canada, the windchill exceeded a value of 2400 on several occasions. The windchill factor has only an indirect effect on starting a piece of equipment, because regardless of the wind velocity the parts of the engine reach the ambient temperature and no more. However, if a piece of equipment is being heated in order to obtain a start the windchill factor does come into play, since the engine then becomes a warm body compared to the surrounding temperatures, and the higher the windchill factor the greater the heat loss will be, and therefore the longer will be the heating time for starting. A second indirect effect is that the operator is definitely affected by the windchill factor, and his effort and proficiency are therefore lowered as the windchill increases. Once an engine is started and running, the windchill factor is a measure of the rate at which heat is lost from the engine so that the higher the windchill factor the greater must be the insulation or protection in order for an engine to maintain any particular operating temperature.

Self Adjusting Valve Tappet

(*Continued from page 40*)

the valve begins.

When the valve nears full open position, the hammer travels upward, away from contact with the impact pin, and shortly after full open position the hammer has floated to the upper limit of its travel as illustrated at the right. Note that the guide pin has been picked up by the bottom of the hammer slot and moved upward a slight amount. This compresses the guide pin spring and cushions the impact of the hammer.

During closing of the valve, motion of the hammer is downward and reaches a maximum as the valve closes. Clearance is created when the hammer strikes the impact pin and imparts a sharp twisting blow which turns the screw against the torsion spring wind up. Following this, standard operating clearance is established as the screw is rotated in a lengthening direction by the torsion spring. Any new length requirements resulting from wear or changing temperature are taken care of during this lengthening operation. Actually, a correct tappet clearance adjustment is made each time the valve closes.

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Flat and coiled springs to meet every requirement. Every Garrett spring has controlled tension built into it to assure satisfactory performance under all conditions. All types of flat springs . . . coil springs—compression, extension . . . made of round, square or rectangular wire.

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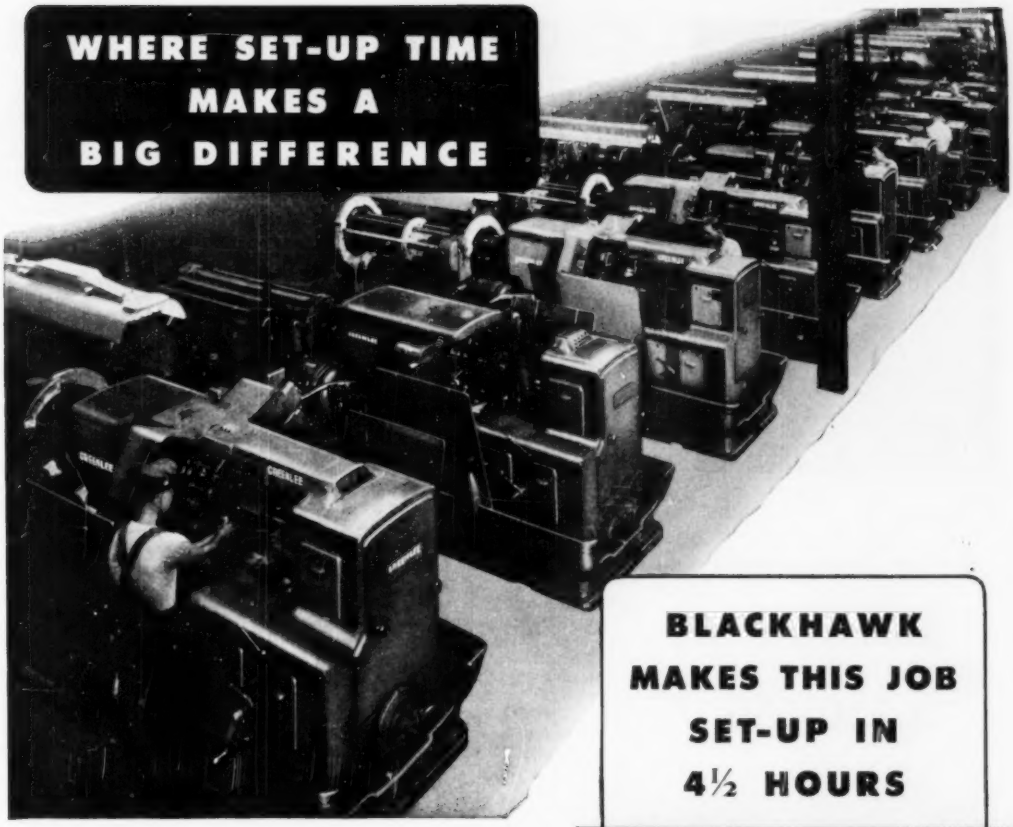
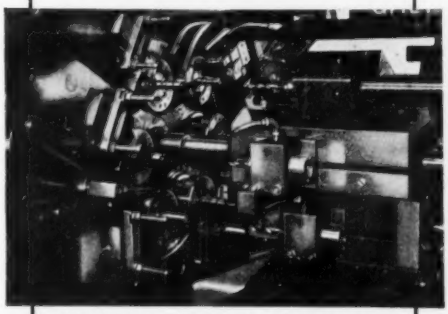
WHERE SET-UP TIME MAKES A BIG DIFFERENCE

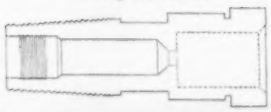


BLACKHAWK MAKES THIS JOB SET-UP IN 4½ HOURS



SET-UP FOR "SPEE-D"* COUPLER PART

*T. M. Reg. U. S. Pat. Off.



Twelve operations on this steel piece are performed in a cycle time of 21 seconds. Included are forming and shaving to close tolerances, facing, turning, and undercutting, accurate deep drilling, threading, and tapping. Set-up time is 4-1/2 hours. Only one tool change is needed on a 10,000 run.

To be profitably accomplished, small-lot production on multiple-spindle screw machines requires a minimum of set-up time. Greenlee Automatics were especially designed for rapid machine changes to accommodate small-lot work.

The Blackhawk Mfg. Co., of Milwaukee, manufacturers of hydraulic jacks, bending equipment, tools, and fittings, find Greenlee Automatics well-suited for their critical production requirements. They like the Greenlee's easily-changed forming slide cams, rapid stroke-setting arrangement, and interchangeable tooling facilities, finding these and other features ideal for making profitable runs of 10,000 or more pieces. Properly-tooled Greenlee Automatics can solve your production problems, whether your job runs are large or small. Why not submit *part prints for cost-saving recommendations?*

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The REAL cost of a fastener is in terms of the final product cost.

But some people *will* cut corners on that small *first* cost—and end up with a whopping *big* cost in assembly.

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AIRBRIEFS

(*Continued from page* 52)

Tools Not Blades

It has been estimated that in wartime a total of about 30 million compressor and turbine blades would have to be produced each month to meet the aircraft production schedules. In a normal production item this might be attained simply by providing the required tooling and letting the American "production miracle" take care of the volume. The Aircraft Gas Turbine Division of the General Electric Co. recently revealed that the case is not quite so simple due to the short die life in the production of the high-strength blades. G-E is currently obtaining only 1000 to 1500 blades from a pair of forging dies and, at this rate, wartime conditions would require about 20,000 sets of dies per month. As a result, G-E has its forging dies on a production basis too and these are made by forging! This short die life in production is created by the use of precision forging of the blades rather than rough forging and final machining, as in most other production items. Use of this precision forging technique plus the blade hardness required results in the necessity for a die production line that rivals the actual engine production line in output.

Britain Widens the Lead

The more optimistic aircraft spokesmen in the U. S. believe that we are rapidly catching up with the British in the jet aviation field, both in engines and airplanes, and indicate that we can catch the DeHavilland Comet jet transport in just a few more years. But even these optimists have been steadied by the revelation that the Comet's engineers have not been standing still waiting for us. A new and greatly improved Comet is now on the way that should widen the British lead by several more years. Current production Comet is powered by two radial-flow DeHavilland Ghost turbojet engines of 5000 lb thrust, giving it a cruising speed of 490 mph and its fuel capacity permits a 36-passenger normal operation of about 2000 miles (not enough to cross the Atlantic nonstop). DeHavilland engineers have designed a new Comet powered by either Armstrong Siddeley Sapphire or Rolls-Royce Avon axial-flow turbojet engines of better than 7000 lb thrust each. These axial-flow engines have better fuel consumption than the radial-flow type. Additionally, fuel capacity has been increased by leading edge tanks. Estimates place the cruising speed of the new Comet at 525 mph and its new range beyond that required for non-stop trans-Atlantic service. Not only would the new Comet cut in half the trans-Atlantic time required but it will operate at a 20 per cent cost saving over current aircraft. Not only is the Comet hard to beat, it appears that it may prove unbeatable for many, many years.

Marine Helicopters

The U. S. Marine Corps, which has always led all other branches of the service in the evolution of new fighting tactics, is willing to abandon its highly-developed amphibious attack technique in favor of helicopter-delivery of its assault. Marine General Clifton Gates, Commandant, says he wants assault helicopters capable of delivering 30 or more combat troops plus equipment and supplies. Korea has proved the capabilities of the helicopter as a vital combat weapon and the Marine Corps, at least, is making it an essential component of its future planning and training. The helicopter nullifies the formation of fortified defense positions, such as along a beach, and permits the assault to be made anywhere up to 100 miles behind the beach or front lines. It is on this score that its supposed vulnerability to ground fire proves far less than that of troops landed on a beach in amphibious vehicles against dug-in enemy fortifications. It is only this year that transport-size helicopters have passed flight tests but the largest only accommodates 10-12 troops. Piasecki has a 21-troop version in process but the 30 or more places asked by Gates are still in the future. The future may well see "airphibious" assaults replacing the amphibious assaults that won the Pacific from the Japs.

Publications Available

(*Continued from page* 54)

L-138 Atmosphere Furnaces

Surface Combustion Corp.—A comprehensive bulletin, SC-148, describing the complete line of standard rated atmosphere furnaces, has just been released. The applications of these furnaces to modern, controlled atmosphere heat treating are described in detail.

L-139 Hand Pallet Truck

Lyon-Raymond Corp. — New literature, Bulletin 222, is now being issued to describe heavy duty hand pallet trucks in capacities of 4000 lb and 6000 lb. Features of these products are described and illustrated, and complete specifications are listed for both models.

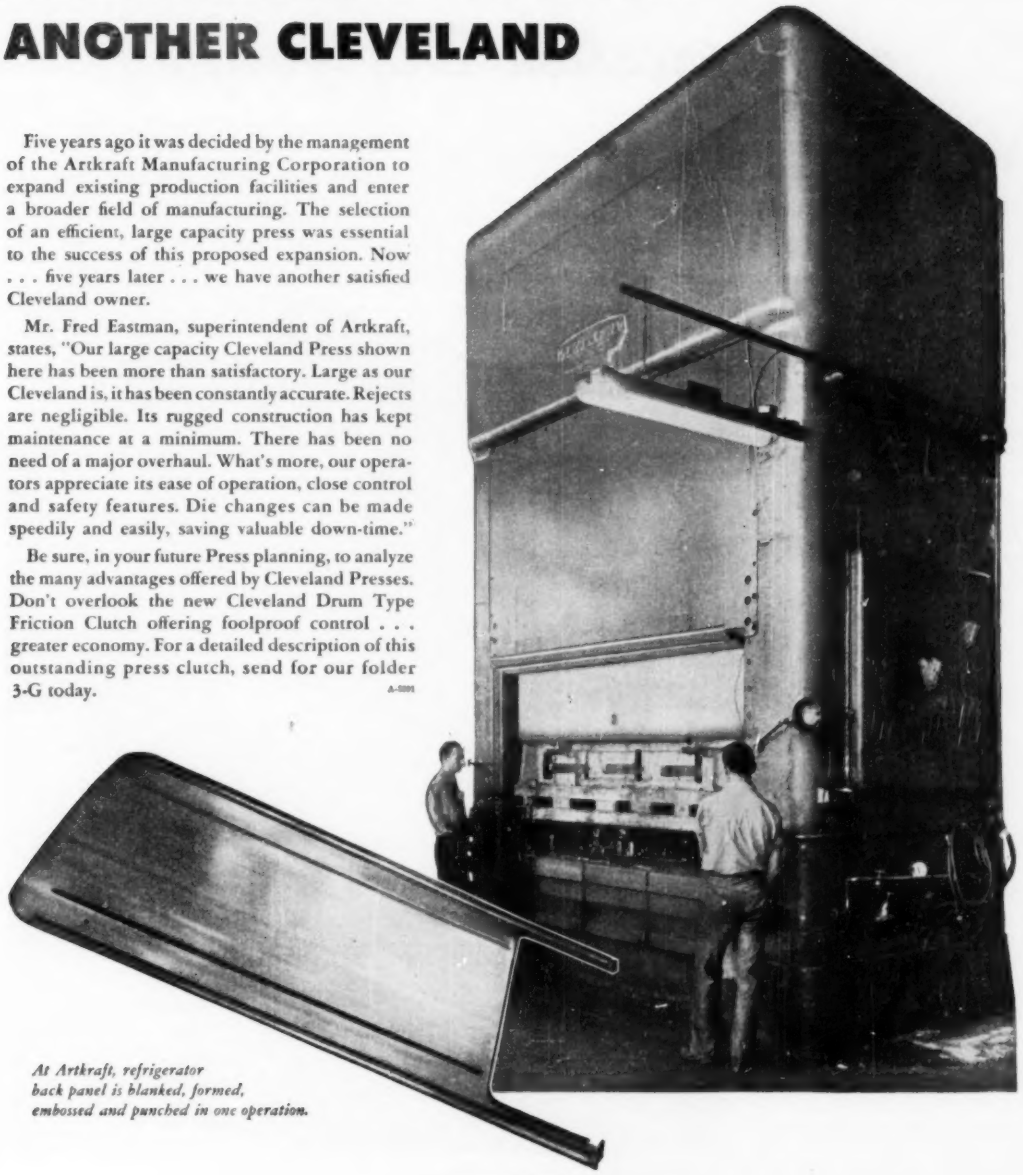
ANOTHER RIGHT CHOICE...
ANOTHER CLEVELAND

Five years ago it was decided by the management of the Artkraft Manufacturing Corporation to expand existing production facilities and enter a broader field of manufacturing. The selection of an efficient, large capacity press was essential to the success of this proposed expansion. Now . . . five years later . . . we have another satisfied Cleveland owner.

Mr. Fred Eastman, superintendent of Artkraft, states, "Our large capacity Cleveland Press shown here has been more than satisfactory. Large as our Cleveland is, it has been constantly accurate. Rejects are negligible. Its rugged construction has kept maintenance at a minimum. There has been no need of a major overhaul. What's more, our operators appreciate its ease of operation, close control and safety features. Die changes can be made speedily and easily, saving valuable down-time."

Be sure, in your future Press planning, to analyze the many advantages offered by Cleveland Presses. Don't overlook the new Cleveland Drum Type Friction Clutch offering foolproof control . . . greater economy. For a detailed description of this outstanding press clutch, send for our folder 3-G today.

A-5091



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A HEAVY PRESS *makes Light Work of Impression Die Forging*

Ajax Solid Frame Forging Presses are engineered and built to produce impression die forgings of highest quality at new high rates of production and at a minimum cost. The great rigidity of the solid steel frame, the instantaneous response to the treadle achieved by the patented air clutch, the accuracy of slide alignment and the minimized period of contact of the hot metal with the dies all contribute to making impression die forging easier and less costly than on slower, less rigid and less accurate presses . . . for impression die forging use an AJAX Forging Press.

Dies and Forging operations for forging tractor steering knuckles in pairs.

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AJAX HIGH SPEED PRESS *forging tractor gear blank at International Harvester Company, Louisville, Kentucky, Works.*

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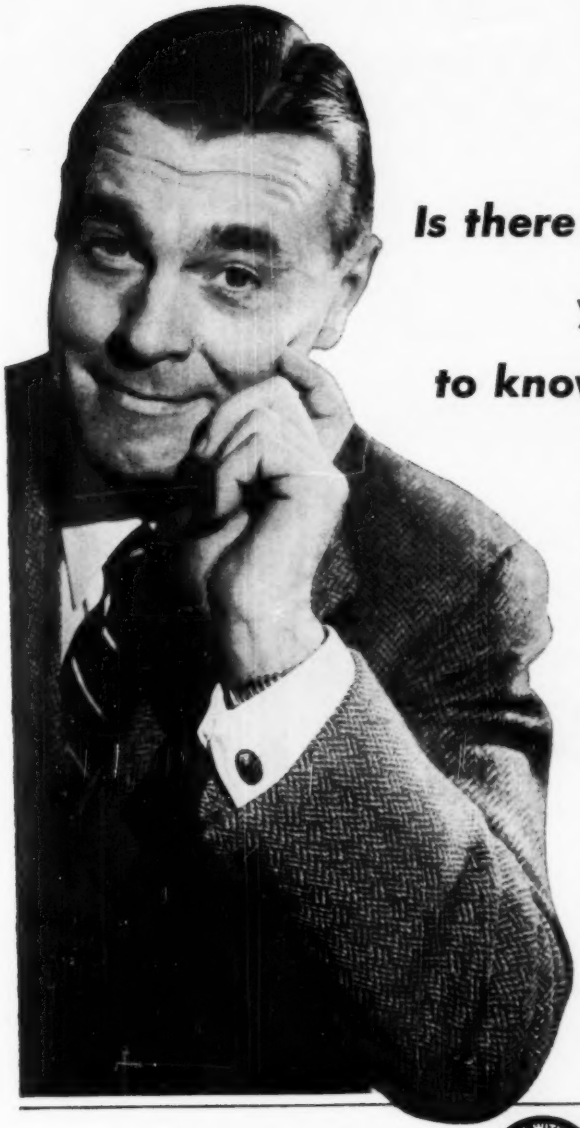

Is there anything *special* you'd like to know about tubing?

It's hard to keep up with the latest developments in tubing, they come so fast. New steels are being produced or *new uses* are being found for the old stand-by analyses that have given years of proved service. So it pays to be sure that you have the very latest information that will enable you to select the tubing that is best and most economical for *your particular job*.

We can give you that information. Because in our 60 years as the world's largest manufacturer of tubular products, National Tube Company has built up a file of case histories that is probably unequalled anywhere. And there's a good chance that a problem which plagues you has been encountered by us before . . . and solved.

One of the reasons for this confidence on our part is the fact that we don't produce tubing in just one or two steel analyses. On the contrary, National Tube manufactures seamless pipe and tubing in a *complete* range of steel analyses from low carbon, through the alloys on up to and including the stainless steels. In addition, the widest range of sizes and wall thicknesses are available for every mechanical and pressure purpose.

If you have a tubing problem, take advantage of our specialized knowledge. We'll recommend tubing that, at the lowest possible price, will do the best job for you.

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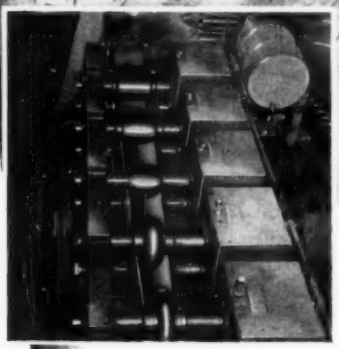

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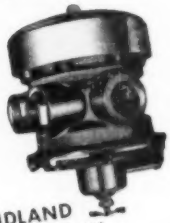

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Here, an ingenious machine, plus *the atomic hydrogen weld*, a patented Midland process, transforms flat steel into perfect tubing.

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Quality is a claim most manufacturers make but few can prove it as consistently and as effectively as Centrifugal. And anywhere along the line from beginning to end. When you receive Centralloy sleeves and piston ring pots, your scrap loss day in and day out should **average** less than 3% (and as low as 1.5%) according to figures we receive from manufacturers we supply. Match these figures against those of any others.

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Centrifugally cast electric alloys — heat-treated by exclusive patented process for Super Duty

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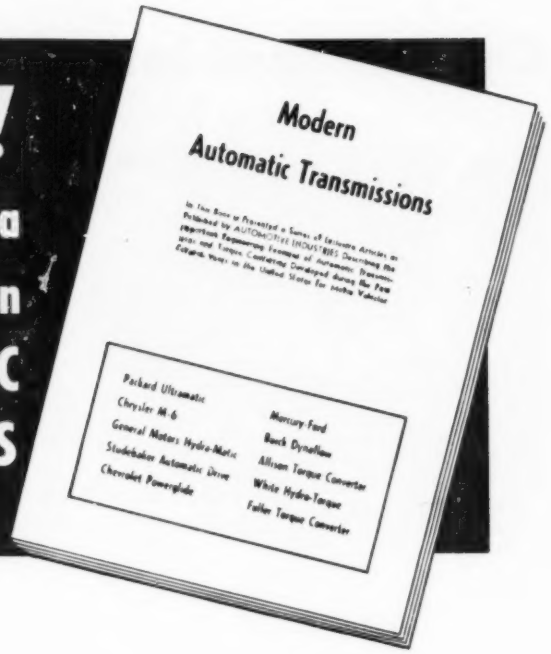
Complete Data On Modern AUTOMATIC TRANSMISSIONS



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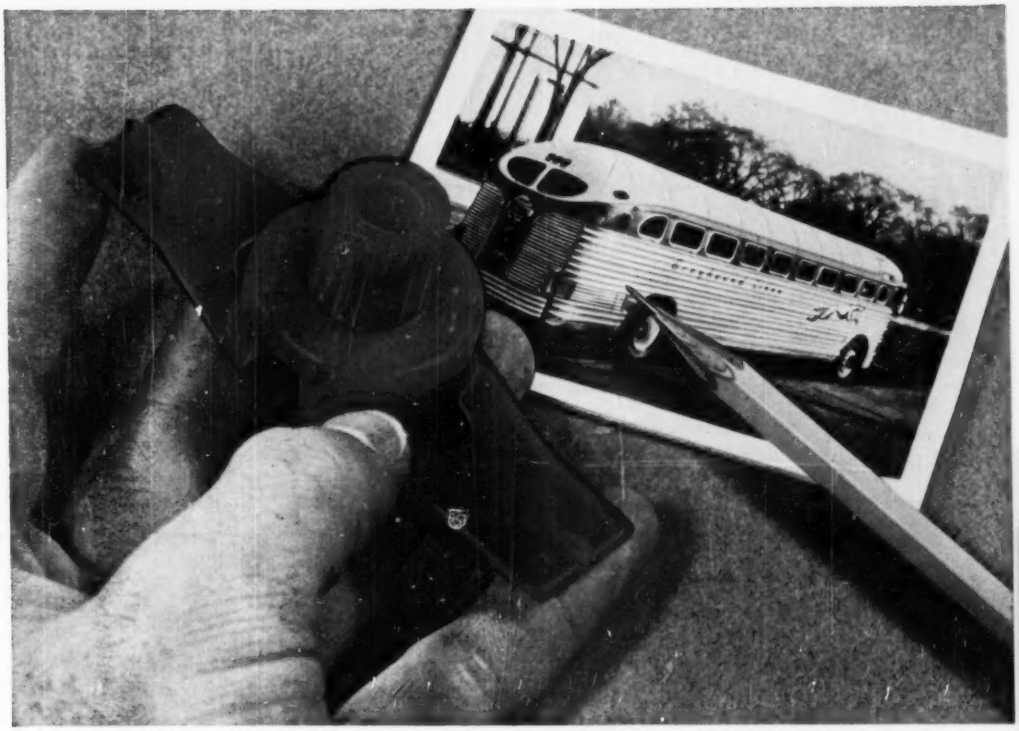
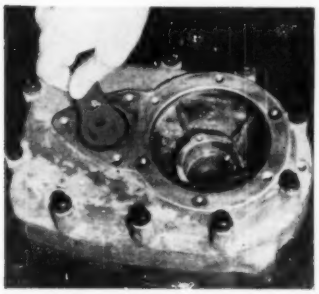


DU PONT NYLON CUTS COST OF COUPLING ABOUT 90% ...SOLVES VITAL WEAR PROBLEM

Replacements in Greyhound diesels reduced phenomenally

The Greyhound Corporation has not only solved a serious mechanical problem with this nylon plastic part, but has also cut costs of the part itself by about 90%. The source of trouble was a two-piece steel coupling in diesel bus engines (connecting the water pump with a drive shaft from the blower). This part failed so frequently that as many as 200 buses went to the repair shop each month to have a new coupling installed.



ELASTICITY OF NYLON permits easy installation of the part. The nylon oil flippers that protrude from the coupling are flexible, permitting the part to be installed or removed without extensive dismantling of the engine. Cuts maintenance time and costs . . . another saving for Greyhound!

After many modifications of the steel part failed to stand up, nylon plastic was tried. Now, out of 1000 nylon couplings in use for six months, only a few have had to be replaced.

The new and intricate nylon part is made in one piece by rapid, mass-production injection molding. This, plus the fact that nylon's light weight makes it much cheaper than many metals on a volume basis, accounts for Greyhound's remarkable cost saving.

There are many other uses for nylon plastic in the automotive industry — bearings, gaskets, electrical parts, valve seats, gears. It offers such properties as: resistance to chemicals, abrasion, fatigue and permanent distortion. Nylon permits close mating without chatter, has good bearing characteristics, operates quietly and smoothly with less lubrication than is required for metals — in some cases, with *no lubrication*.

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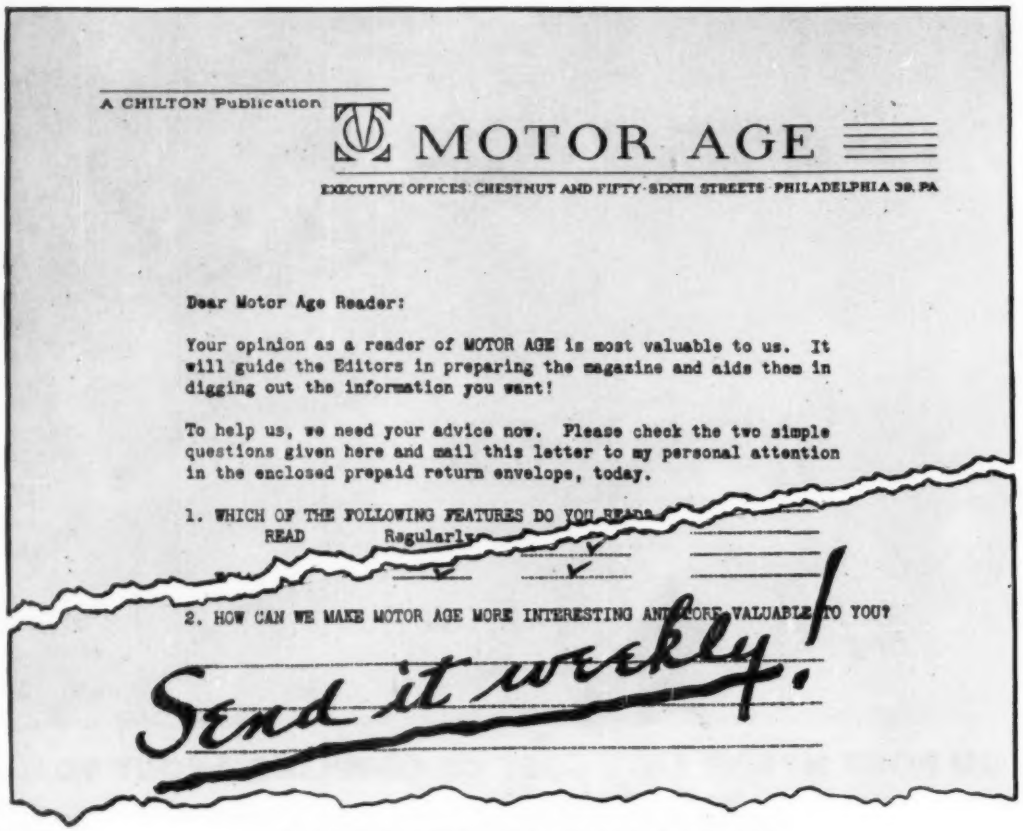
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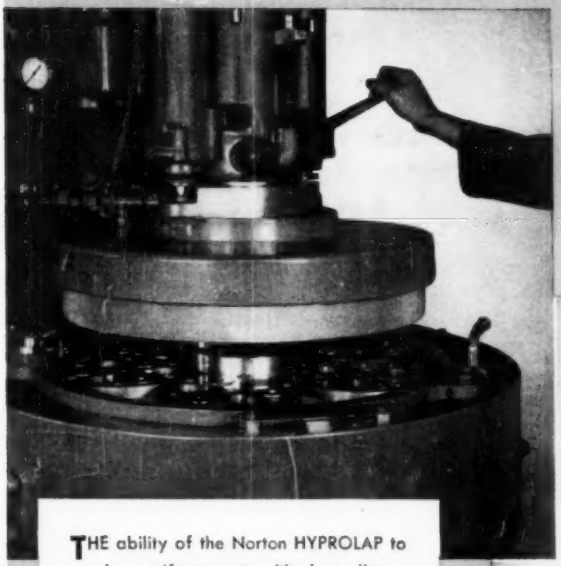

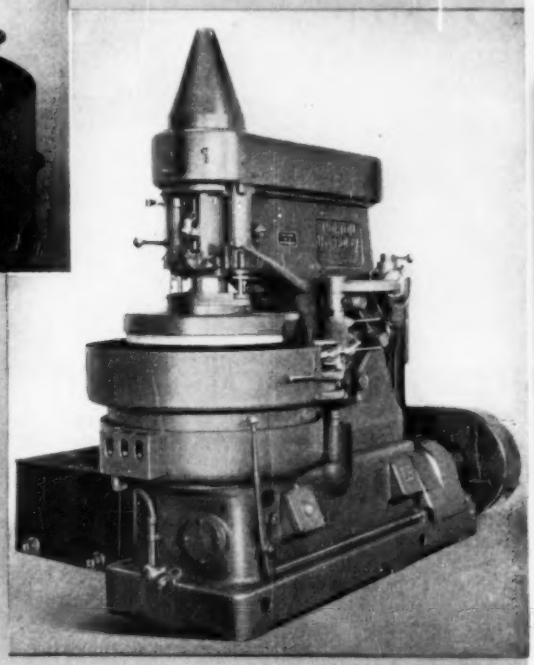

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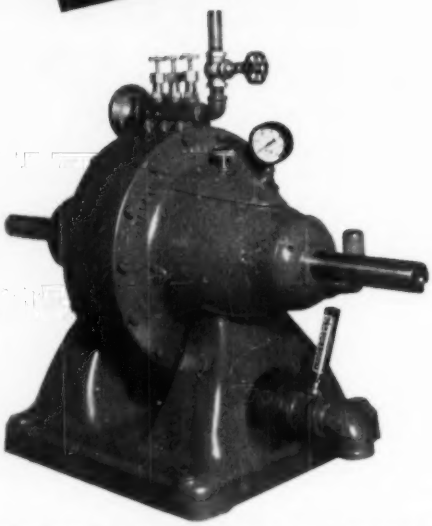
TAYLOR HYDRAULIC DYNAMOMETERS



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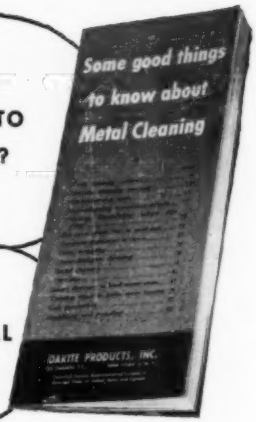
528 A West Highland Avenue, Milwaukee 3, Wisconsin

Manufacturers of HI-EFF Hydraulic Dynamometers — Static Balancing Machines — Sensitive Drilling Machines.

WHAT'S THE FASTEST WAY TO CLEAN METAL?
See page 11

WHAT'S THE MOST ECONOMICAL WAY?
See page 9



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"Some good things to know about Metal Cleaning"

answers many questions that mean better production for you, more money in your pocket. You'll want to read more about:

Can one cleaning material do all metal-cleaning jobs? *See page 5.*

What kind of cleaner attracts both oil and water? How does this help remove buffing compound residues and pigmented drawing compounds? *See page 8.*

What are the advantages of reverse current for electrocleaning steel? *See page 15.*

Can you electroclean brass without tarnishing? *See page 18.*

Can you clean steel and condition it for painting for less than 20 cents per 1,000 square feet? *See page 26.*

Would you like a cleaner that removes rust and oil in one operation, often eliminating all need for pickling? *See page 28.*

Does your burnishing produce a luster you are proud of? *See page 32.*

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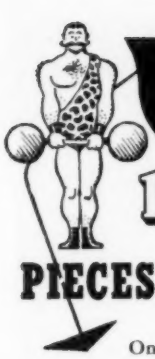

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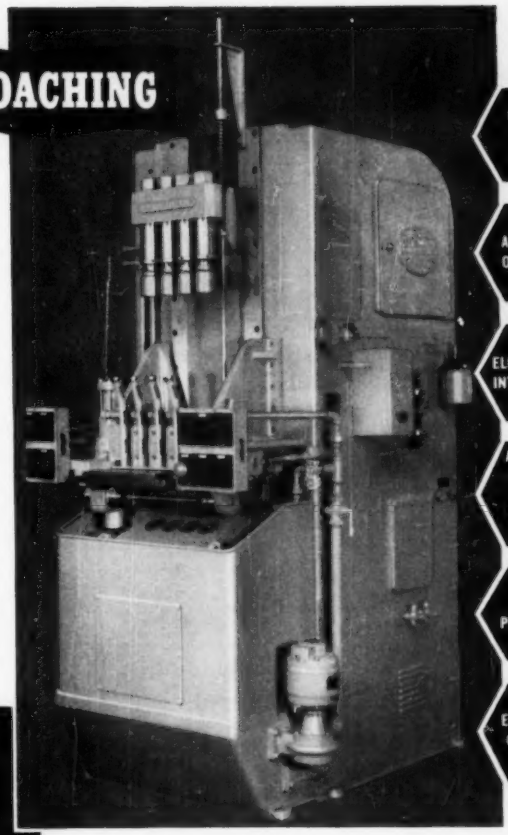
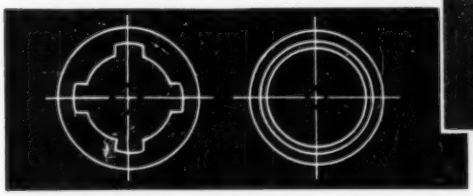
One thousand pieces per hour are produced on this *American* fully automatic VP-3, 10-ton, 30-inch stroke internal broaching machine. Tube type magazines and hydraulic loading slide are provided. Loading slide is interlocked with the machine cycle to transfer the parts to the four identical broaching stations. The unit is completely automatic. The operator need only load the magazines.

American broach engineers will analyze your problem and recommend the proper broaching method and machine. There is no obligation for this service.



- MULTIPLE WORK STATIONS
- AUTOMATIC OPERATION
- ELECTRICALLY INTERLOCKED
- AUTOMATIC EJECTION OF BROACHED PARTS
- HIGH PRODUCTION
- ECONOMICAL OPERATION



Left: Four splines are broached on this sleeve. *Right:* .012 stock is removed from I.D. of this bearing. (These 1¼" long parts are shown actual size.)

WRITE for this *free* circular describing *American's* pull up broaching machines. Ask for circular VP.

This machine is tooled to broach the two parts illustrated at left. One operation is to pull broach the hole in bearings, removing .012 stock. *By changing only the broaches,* the machine is adapted to pull broach four splines in sleeve parts.

The completely automatic cycle of this machine is as follows: (1) Loading slide transfers parts from magazine to broaching position. (2) Broaches are automatically elevated through the work, work table, and into automatic pullers on machine ram. (3) Broaching stroke begins automatically. At the end of this stroke, parts are discharged from machine. Loading slide automatically returns to magazines to pick up more parts. (4) Machine slide automatically returns downward, disconnecting broaches. (5) Broaches are automatically lowered to starting position. Note: *All steps in the above cycle are electrically interlocked.*

AMERICAN *American* BROACH & MACHINE CO.

A DIVISION OF SUNSTRAND MACHINE TOOL CO.

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See *American* First—for the Best in Broaching Tools, Broaching Machines, Special Machinery

STANDARD RUST PROOFING PRACTICE THE WORLD AROUND

CHEMICALS ACP PROCESSES

SPECIFICATION CHEMICALS FOR THE GOVERNMENT AND ITS CONTRACTORS

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SPECIFICATION NUMBER	ACP SPECIFICATION CHEMICAL
QQ-P-416	"Lithoform"
	"Zinodine"
RR-C-82	"Lithoform" No. 32
MIL-C-5541 (See also QPL-5541-1)	"Alodine"
MIL-S-5002	"Alodine"
	"Granodine" (Dip, Spray and Brush grades)
JAN-C-490, Grade 1	"Granodine" (Dip, Spray and Brush grades)
JAN-F-495	"Granodine" (Dip, Spray and Brush grades)
	"Lithoform"
JAN-L-548	"Permadine"
AN-E-19	"Alodine"
	"Zinodine"
AN-F-20	"Alodine"
	"Granodine" (Dip, Spray and Brush grades)
	"Lithoform"
	"Permadine"
	"Thermoil-Granodine"
	"Zinodine"
	(See also U.S.A. 3-213)
U.S.A. 57-0-2	
Type II, Class A	"Thermoil-Granodine"
Type II, Class B	"Permadine"
Type II, Class C	"Granodine" (Dip, Spray and Brush grades)
U.S.A. 51-70-1	
Finish 22.02, Class A	"Thermoil-Granodine"
Finish 22.02, Class B	"Permadine"
Finish 22.02, Class C	"Granodine" (Dip, Spray and Brush grades)
U.S.A. 50-60-1	"Granodine" (Dip, Spray and Brush grades)
U.S. Navord O.S.675	"Alodine"
U.S.N. Appendix 6	"Lithoform"
Navy Aeronautical M-364	"Permadine"
	"Thermoil-Granodine"
AN-C-170	(See MIL-C-5541)
U.S.A. 72-53	(See AN-F-20)
AXS-1245	(See JAN-C-490)

Rust Removing and Metal Conditioning Chemicals

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JAN-C-490, Grade II	
Type 4	"Deoxidine" Nos. 126, 512, 526, 624, 670
Type 5	"Deoxidine" Nos. 170, 171, 670
U.S.A. 3-213	
Type I	"Deoxidine" (Wash-off grades)
Type II	"Deoxidine" (Wipe-off grades)

Metal Cleaning Chemicals

SPECIFICATION NUMBER	ACP SPECIFICATION CHEMICAL
JAN-C-490, Grade II	
Type 2	"Ridoline"
Type 6	"Ridosol"
U.S.A. 3-192	"Ridoline" No. 3192
U.S.N. Appendix 6	"Deoxidine"

Acid Inhibitors, Pickling

SPECIFICATION NUMBER	ACP SPECIFICATION CHEMICAL
U.S.N. 51-1-2	"Rodine"

Write us for descriptive folders and further information on the specification chemicals listed above. Additional copies of this chart are available on request.

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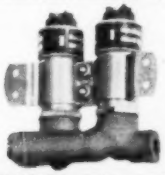

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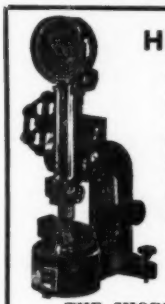

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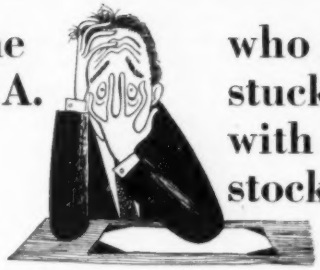
the P.A. who got stuck with the stock



In August he told the printer he wanted 500,000 of those pink production control labels for marking component parts (enough to last through March anyhow). But in October, Production reversed themselves. They said they wanted *blue* production control labels . . . not pink. And besides, new information had to be added. It took a long while to get those pink labels off the shelves and into the incinerator.

* * *

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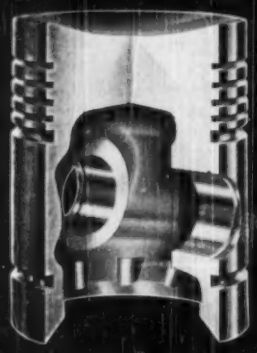

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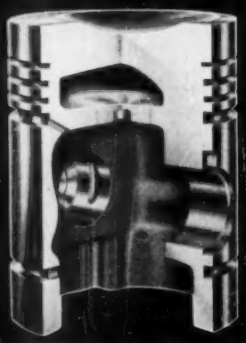

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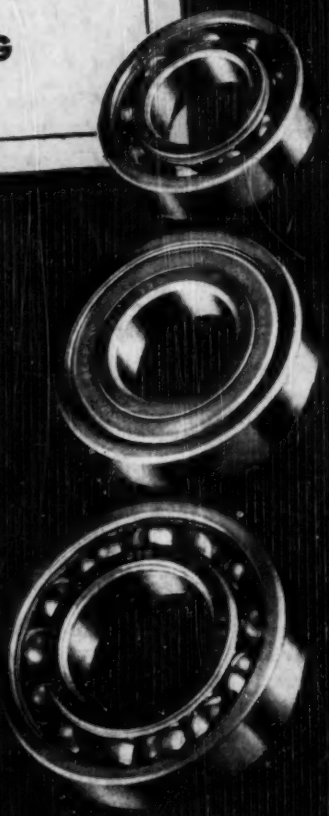

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